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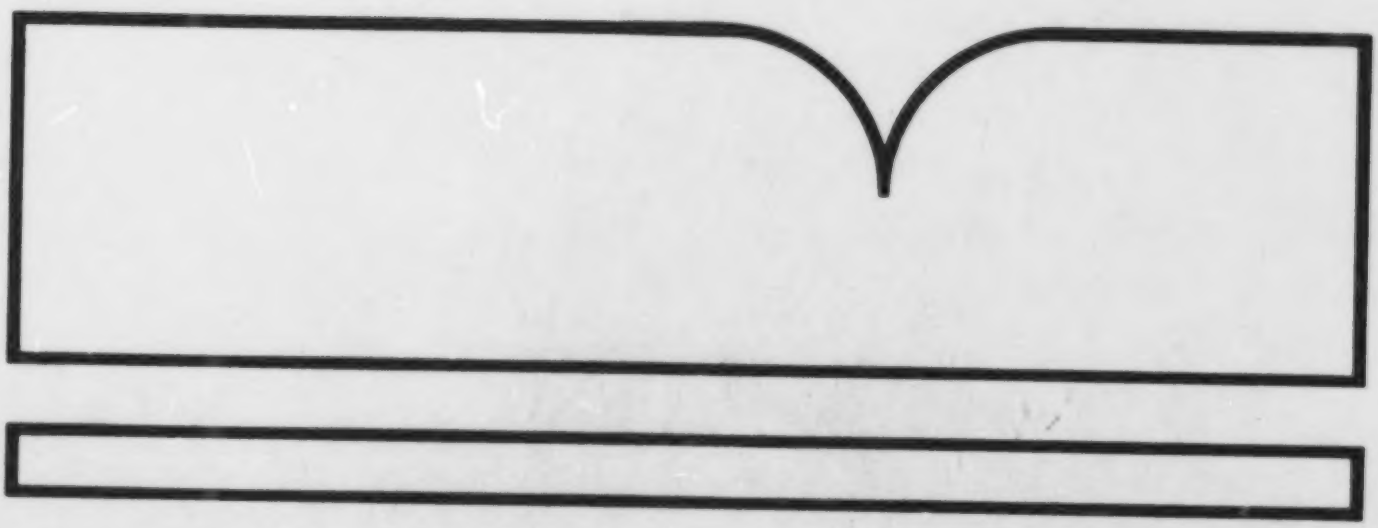
Energy Consumption Patterns
Illinois, Indiana, Kentucky, Ohio Pennsylvania, and West Virginia (1975)

Ohio River Basin Energy Study
Urbana, IL

Prepared for

Environmental Protection Agency
Washington, DC

Apr 81



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16. ABSTRACT

This report was prepared as part of the Ohio River Basin Energy Study (ORBES), a multidisciplinary policy research program supported by the Environmental Protection Agency. It presents energy consumption data for the year 1975 for the states of Illinois, Indiana, Kentucky, Ohio, Pennsylvania, and West Virginia, as well as for the United States as a whole. The entire state of Kentucky and substantial portions of the five other states comprise the ORBES region.

Energy use is examined both by consuming sector and by fuel source. The principal components of each sector are described briefly, and detailed comparisons are made among national, six-state, and individual state consumption patterns for 1975. Preliminary estimates are given for total energy consumption in the United States, the six states, and individual states for the years 1976, 1977, and 1978.

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ENERGY CONSUMPTION PATTERNS: Illinois, Indiana, Kentucky, Ohio, Pennsylvania, and West Virginia (1975)

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Ohio River Basin Energy Study (ORBES)

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FOREWORD

The Ohio River Basin Energy Study (ORBES) is an interdisciplinary, multi-university inquiry into the environmental, economic, and social impacts of energy facility development in a major portion of the Ohio River Basin. The study was initiated by the U.S. Environmental Protection Agency in 1976 in response to a directive from the U.S. Senate Appropriations Committee.

Most of the ORBES research was conducted by a group of faculty members at the University of Illinois, Indiana University, the University of Kentucky, the University of Louisville, The Ohio State University, the University of Pittsburgh, Purdue University, and West Virginia University. In a few instances, the necessary expertise was found at other universities or independent research organizations.

This report is one of a series produced in support of the overall ORBES assessment. For a summary of the entire study, see Ohio River Basin Energy Study (ORBES): Main Report, by the ORBES Core Team, also being published by the U.S. Environmental Protection Agency.

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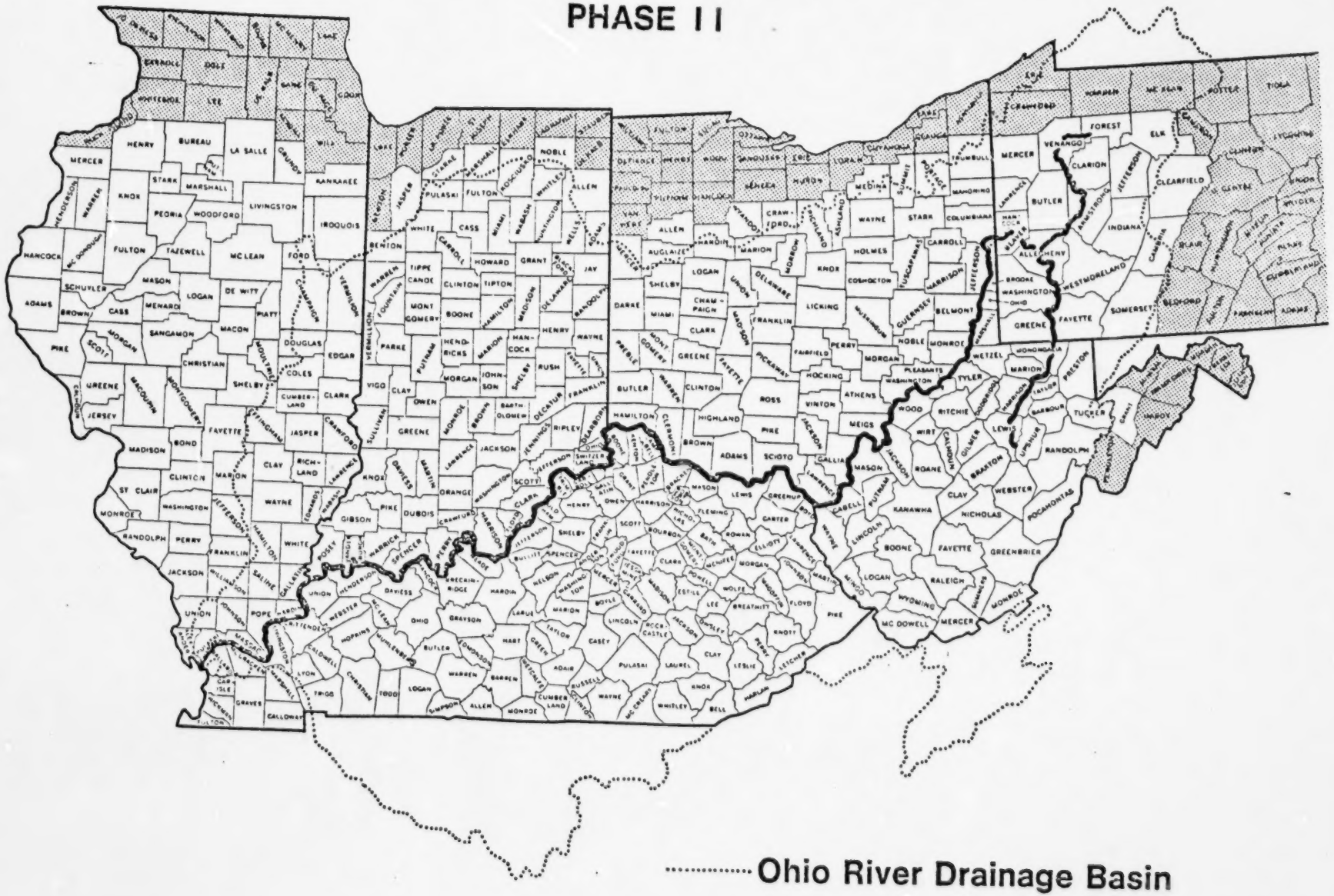
OHIO RIVER BASIN ENERGY STUDY REGION

PHASE II



..... Ohio River Drainage Basin

I. INTRODUCTION

This document presents energy consumption data for the year 1975 for the states of Illinois, Indiana, Kentucky, Ohio, Pennsylvania and West Virginia. Data for the United States are reported in two ways: for the nation as a whole and as the sum of the fifty states. Consumption data given for the U.S. as a whole includes all energy consumed in the country. The "sum of the fifty states" is calculated by summing the data for the individual states; it is lower than the consumption figures given for the U.S. as a whole owing to the omission of certain fuels on a state-by-state level. These differences are discussed in detail in Chapter III.

The entire state of Kentucky and substantial portions of the other five states constitute the Ohio River Basin Energy Study (ORBES) area, as shown in the map on page vi. The data provided in the report, however, are given for the entire state in each instance and the term "region" as used in the report refers to the six-state region.

Energy use is examined both by consuming sector and by fuel source. The principal components of each sector are described briefly before detailed comparisons are made between national, regional, and individual state consumption patterns for 1975. Preliminary estimates are given for total energy consumption in the United States, the six-state region, and the individual states for the years 1976, 1977 and 1978.

Energy use pattern tables for the United States as a whole, the sum of the fifty states, the six-state region, and the individual states comprising the ORBES region are included in Appendixes A and B for the years 1975 and 1974, respectively. [1]

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[1] Tables for the year 1974 are included for historical purposes. Because the percentage contributions of the components are approximately the same for both 1974 and 1975, only 1975 data are described in detail in this report.

II. ENERGY USE CATEGORIES

Energy consumption patterns are generally represented in two ways: energy use by consuming sector and energy use by fuel source. Both methods are discussed briefly below.

Consuming Sectors

The three major consuming sectors are the residential/commercial sector, the industrial sector, and the transportation sector. A fourth consuming sector, identified as waste heat in this report, refers to the energy dissipated in the process of converting primary fuels to electricity. Energy lost in the transmission of electric power and electricity produced but not accounted for also are included in the waste heat sector in this report.

1. Residential/Commercial Sector

This sector includes all energy used to heat, cool, ventilate and light homes and commercial structures (office buildings, retail stores, etc.). Also included is the energy used to power household appliances and commercial machines (typewriters, copying equipment, calculators, cash registers, etc.). In addition, energy for street lighting is counted in this sector. It would be desirable to present energy usage separately for the residential and commercial sectors; however, the data are not always available in that form. In this report, the two are combined into one sector.

2. Industrial Sector

Energy used for industrial processes (direct process heat, steam generation, etc.) is included in this sector. Energy used to heat, light, cool and ventilate industrial buildings (excluding office buildings) and to power industrial equipment (pumps, drills, presses, etc.) is also incorporated. Energy used in agriculture (for the operation of grain elevators, tractors and other farm machinery) is assigned to this sector in this report; however, agriculture is sometimes considered as a separate sector in other publications.

3. Transportation Sector

Most of the energy used in this sector is derived from petroleum products. Basically, energy used to move goods and people via rail, automobile, bus, airplane or ship is included in the transportation sector. Energy used to manufacture transportation equipment and to build roads, airports and railroads is accounted for in the industrial sector and, accordingly, is not included here.

4. Electric Power Sector

Electricity may be regarded as a primary energy source by the end user. In actuality, it is a secondary source of energy. In the electric power sector, primary energy inputs from fossil fuels, uranium and hydropower are converted into electric energy; the associated amounts of conversion losses are referred to as waste heat. End use electricity is allocated to the residential/commercial, industrial and transportation sectors; waste heat, the energy lost in the transmission of electricity and small amounts of unaccounted for electricity are allocated to the electric power sector.

Fuel Sources

In addition to the distributed electricity associated with the electric

power sector, other major energy sources are: coal, petroleum, natural gas, nuclear (uranium) and hydropower. A more detailed definition of these energy sources and the manner in which they are allocated to consuming sectors in this report is given in Appendixes C and D.

Units of Measurement

In this report the Btu (British thermal unit) is used to describe the amount of energy available from a source or consumed in a sector. A Btu is defined as the amount of energy required to raise the temperatures of one pound of water at $68^{\circ}F$ and one atmosphere pressure by one degree Fahrenheit. Thus, a Btu is a small quantity. For example, one gallon of motor gasoline contains approximately 150,000 Btu, one pound of bituminous coal about 11,000 Btu, and one cubic foot of natural gas approximately 1,000 Btu. Conversion factors for the various fuels discussed in this report are given in Appendix E.

III. ENERGY CONSUMPTION PATTERNS

This section discusses differences in energy consumption patterns, first describing the national pattern and then analyzing the six-state region and comparing each state with the region and with the nation as a whole.

National Energy Consumption Patterns

Energy consumption data for the U.S. for 1975 and 1976[2], by source and by sector, are presented in Figure 1. The total energy consumed nationally was 69,908.5 x 10^{12} Btu in 1975 with coal, petroleum, natural gas, hydro, and nuclear providing 17.8%, 46.2%, 28.9%, 4.5%, and 2.6%, respectively. The residential/commercial sector used 23.1% of the energy consumed, the industrial sector 31.5% and the transportation sector 25.1%, while waste heat associated with electrical power generation and energy lost in transmission of electricity or unaccounted for electricity comprised 20.3% of the energy used.

These figures include fuels used by the rubber and petrochemical industries, jet fuels used in the transportation sector, and military use of distillate and residual oils. Such information is not available on a state-by-state basis due to proprietary rights. These totals also include consumption

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[2] 1976 consumption figures will be discussed in the concluding chapter.

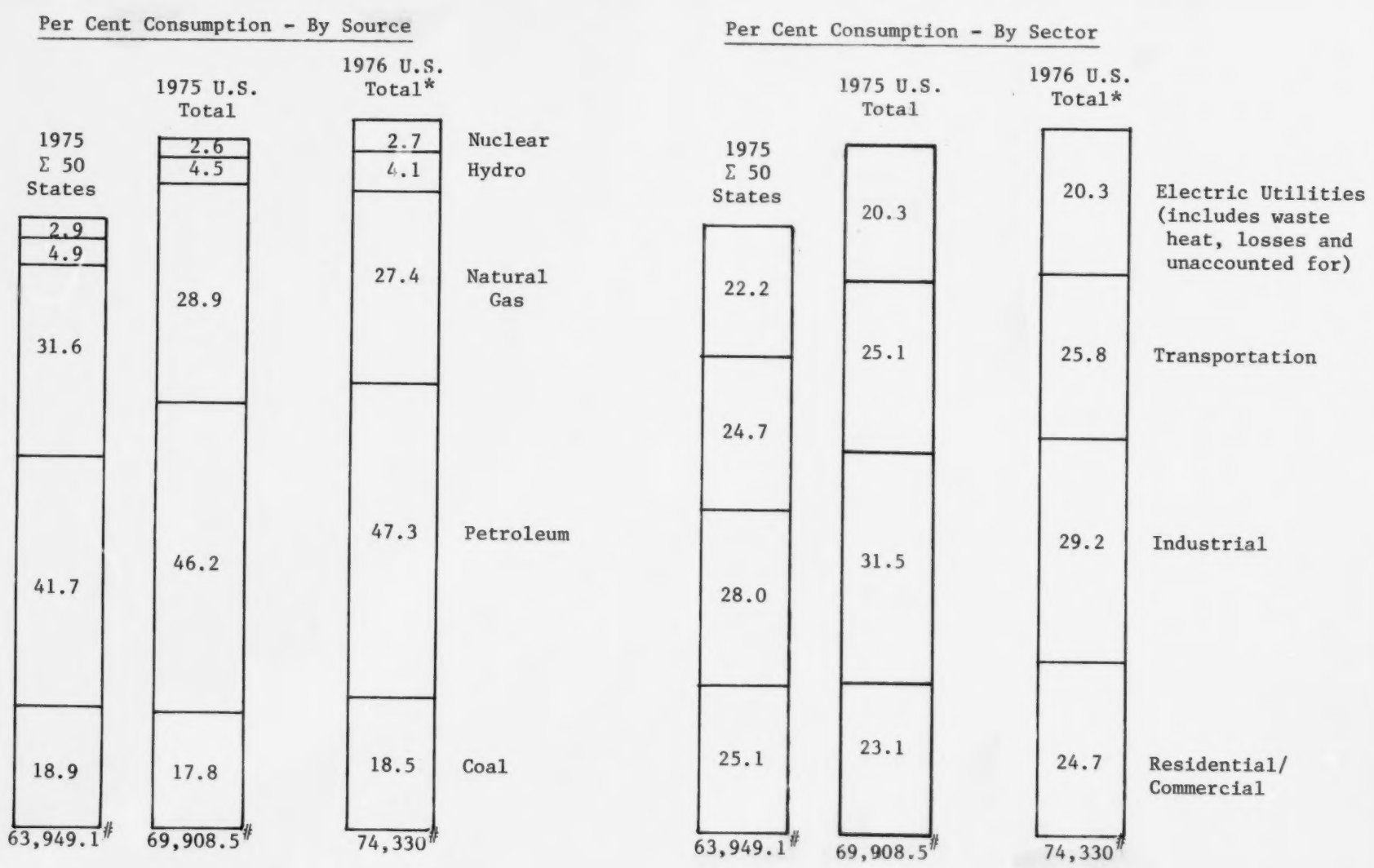

FIGURE 1. NATIONAL ENERGY CONSUMPTION - 1975 and 1976

*1976 figures from U.S. Department of Energy, Energy Information Administration. Monthly Energy Review. June 1978, pp. 44-50.

#Total energy consumption in 10^{12} Btu.

of anthracite coal, of imported kerosine, and of distillate and residual oils for which the consuming sector is not known at the state level. It follows that the summation of the fifty individual states' reported energy consumption is lower than that reported for the total U.S. More detailed information on these differences is given in Appendix C. Figure 1 also presents the "Sum of the Fifty States" by source and sector for 1975.

The sum of the fifty states is used throughout this report when the individual state figures are compared with the national figures. This procedure is internally consistent and the resulting comparisons are more meaningful.

Regional Energy Consumption Patterns

Detailed energy data for 1975 for the states of Illinois, Indiana, Kentucky, Ohio, Pennsylvania and West Virginia have been compiled on both source and sector bases. Table 1 places in perspective the relative contributions of individual states to the level of activity in the six-state region by comparing the contribution of each individual state to the regional totals in terms of population, energy use, employment and personal income for 1975. U.S. figures are also shown. The same information is presented graphically in Figure 2. Within the ORBES states, Illinois has the highest per capita income ($6,750) while Kentucky has the lowest ($4,668). West Virginia has the highest energy use per capita (564.8×10^6 Btu), reflecting the fact that the state is a major exporter of elctricity.[3] Compared to its per cent population, Illinois has a higher percentage of non-agricultural employment and personal income but a lower percentage of total energy use; Indiana and West Virginia have greater percentages of total energy use than of regional population; and

[3]While the phrases "energy use per capita" and "major exporter of electricity seem contradictory, they are not. For every unit of electrical energy exported out of West Virginia, approximately two units of energy are consumed in in the state, thereby increasing the per capita consumption.

Table 1. Contributions of Individual States to Region - 1975

State	Population*	Energy Use (10^{12} Btu)	Energy Use/Capita (10^6 Btu)	Non-Agricultural Employment†	Personal Income# (10^9 current dollars)	Income/Capita§ (current dollars)
ILLINOIS	11,197,000 (25.3%)	3,442.4 (22.8%)	307.4	4,419,000 (26.8%)	75.7 (28.6%)	6,750
INDIANA	5,313,000 (12.0%)	2,212.9 (14.6%)	416.5	1,942,000 (11.8%)	30.0 (11.4%)	5,587
KENTUCKY	3,387,000 (7.6%)	1,088.1 (7.2%)	321.3	1,064,000 (6.5%)	16.6 (6.3%)	4,668
OHIO	10,735,000 (24.2%)	3,641.6 (24.1%)	339.2	4,016,000 (24.4%)	62.7 (23.7%)	5,883
PENNSYLVANIA	11,860,000 (26.8%)	3,724.5 (24.6%)	314.0	4,436,000 (27.0%)	70.3 (26.6%)	5,874
WEST VIRGINIA	1,799,000 (4.1%)	1,016.1 (6.7%)	564.8	575,000 (3.5%)	8.9 (3.4%)	4,815
SIX-STATE REGION	44,291,000	15,125.6	341.5	16,452,000	264.2	5,950
U.S.	213,032,000	69,908.5	328.1	77,051,000	1,257.5	5,834

SOURCES: *U.S. Department of Commerce, Bureau of the Census. Statistical Abstract of the United States, 1977. Table 10, p.11.

†_____. Table 656, p.401.

#_____. Table 703, p.436.

§U.S. Department of Commerce, Bureau of the Census. Statistical Abstract of the United States, 1976. Table 644, p.402.

NOTE: Percentages in parentheses refer to each state's contribution to the six-state region.

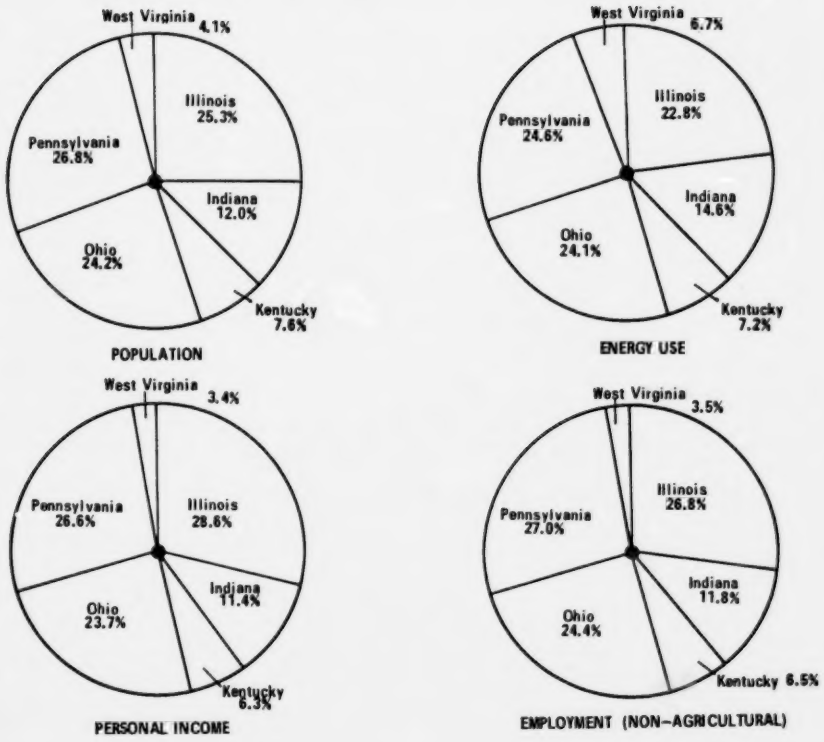

FIGURE 2. CONTRIBUTION OF INDIVIDUAL STATES TO REGION – 1975

both Kentucky and West Virginia account for smaller percentages of non-agricultural employment and personal income than their percentage population.

Energy Consumption Patterns: End Use Sector

An overview of the distribution of the energy used in the various consuming sectors is presented in Figure 3. When the results are presented in terms of the total energy consumed in the six states, the regional shares of the electric utility and residential/commercial sectors do not depart significantly from the national picture. However, the transportation sector accounts for 19.7% in the six-state region as compared with 24.7% for the nation. This difference is made up by the industrial activity of the ORBES states. The individual states show much more variation and will be analyzed sector by sector.

1. Residential/Commercial Sector

Figure 3 shows that the residential/commercial sector accounts for 33.6% of the energy consumed in Illinois, which is considerably higher than 25.1% consumed in this sector in both the nation and the region. In Indiana, Ohio and Pennsylvania the residential/commercial sector accounts for approximately a quarter of the total consumption. In West Virginia and Kentucky the share of the energy used in the residential/commercial sector is substantially lower, 12.2% and 18.5% respectively. The high figure for Illinois may be due to the extensive commercial activity in Chicago. The low figures for West Virginia and Kentucky are partly due to the milder climate in these states. Another important factor is that both states export electricity (exports will be discussed later in this report) and this distorts the other sectors.

Figure 4 presents a more detailed picture of the residential/commercial

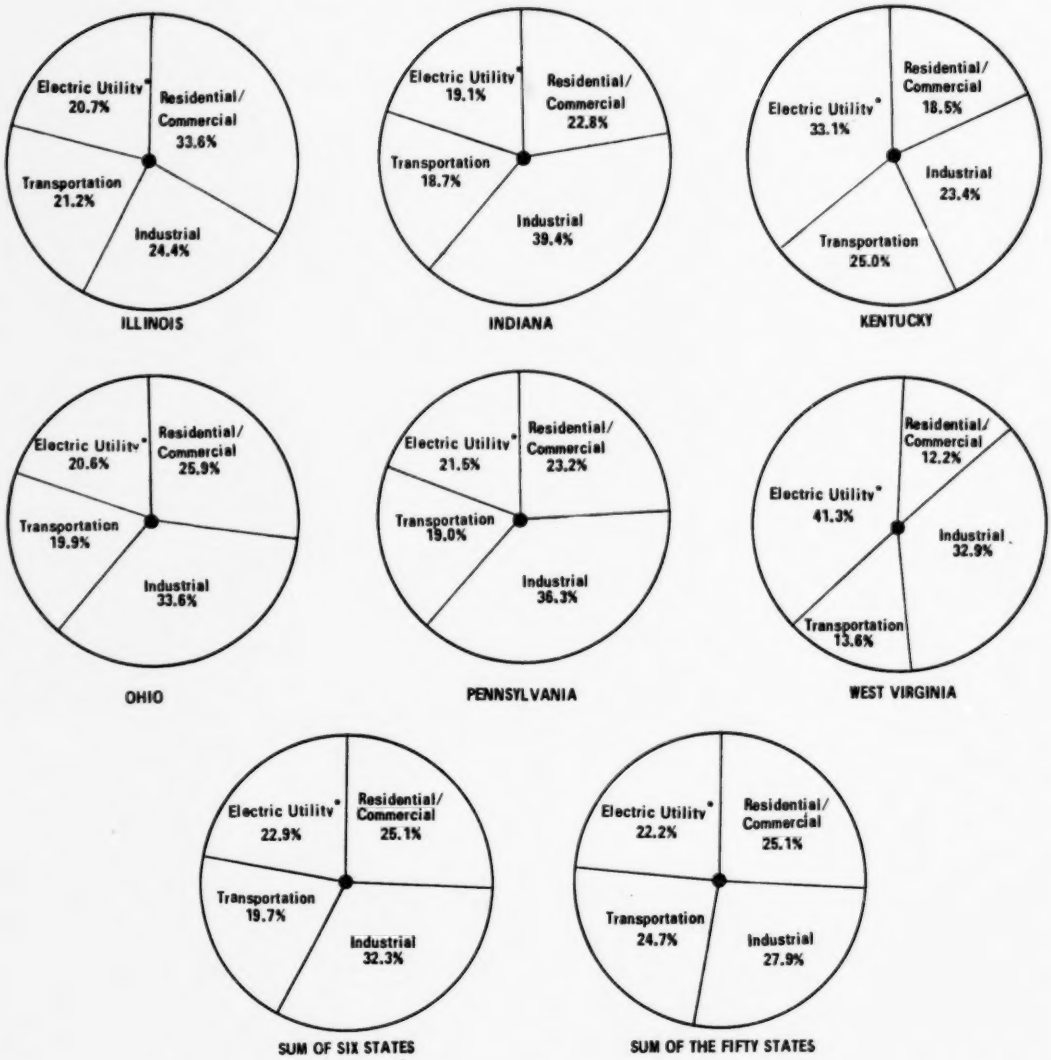

FIGURE 3. ENERGY CONSUMPTION BY SECTOR – 1975

*includes waste heat and lost/unaccounted for electricity

FIGURE 4. ENERGY CONSUMPTION IN THE RESIDENTIAL/COMMERCIAL SECTOR, – 1975

sector by showing the distribution of fuels used in this sector. It indicates that Ohio, Illinois, Kentucky and West Virginia are heavy users of natural gas, which contributes 64.7%, 61.2%, 59.6% and 62.6%, respectively, of the energy used in this sector. Indiana and Pennsylvania employ significantly less energy from this source, 47.1% and 43.9% respectively, which are close to the national figure of 47.3%. However, all the ORBES states rely on natural gas as major primary fuel in the residential/commercial sector and the region as a whole is more dependent on natural gas (56.2%) for this sector than the nation.

At the national level, petroleum provides 29.6% of the energy used in the residential/commercial sector, while the total figure for the six-state region is lower, 24.8%. Pennsylvania and Indiana derive 37.1% and 32.9% respectively of the energy used in this sector from petroleum. The percentages of energy derived from petroleum for the other four states, Illinois (21.7%), Kentucky (19.0%), Ohio (16.0%) and West Virginia (10.3%), are lower than that for the nation or the six-state region.

Electricity contributes from 16.1% (Illinois) to 23.7% (West Virginia) of the energy used in the residential/commercial sector in the six states; the total for the region is 17.5%. The corresponding national figure is 22.4%. Coal contributes little energy to this sector in the ORBES states, ranging from a high of 3.4% in West Virginia to a low of 0.7% in Pennsylvania. Coal provides only 1.5% of the sector's energy regionally and 0.7% nationally.

2. Industrial Sector

Figure 3 shows that both Illinois and Kentucky have a smaller share of their total energy committed to industry (24.4% and 23.4% respectively) than the other four states. Indiana shows the largest at 39.4%; Pennsylvania is

second with 36.3%. The regional total of 32.3% and the national figure of 27.9% fall between these two groups. The figure for Illinois is surprisingly low inasmuch as that state has a considerable number of energy-intensive industries, such as primary metals, chemicals, glass, nonelectric machines, etc.

In the six-state region, 42.6% of the industrial energy is provided by coal, in contrast to 17.5% for the U.S., as shown in Figure 5. This reflects the high concentration of energy-intensive coal-related industries in the region. Natural gas provides 28.1% of the region's industrial energy, significantly less than the national figure of 49.2%. This difference is 21.1%, close to the regional-to-national coal use differential of 25.1%. The relative share of electricity used in the industrial sector is approximately the same in the nation and the six-state region--12.9% and 12.7% respectively. The difference in the petroleum sector is slightly larger--20.4% for the nation as opposed to 16.6% for the region.

An examination of the fuel mix in the industrial sector in the six states reveals major differences which must be taken into account in the development of alternative energy futures in the ORBES region. Figure 5 shows that Illinois is the smallest user of coal in this sector, deriving only 17.9% of its industrial energy from this source. West Virginia uses the largest percentage of coal for industrial consumption (63.1%), with Pennsylvania next (54.1%), followed by Indiana (46.9%), Ohio (41.9%), and Kentucky (25.7%). Higher coal use implies proportionately more coal-dependent energy-intensive industries, such as steel and other primary metals employing coke-producing processes. (Electric power generation, while obviously an energy-intensive industry, is discussed in chapter IV.) Within the industrial sector the proportion of energy requirements derived from coal provide an indication

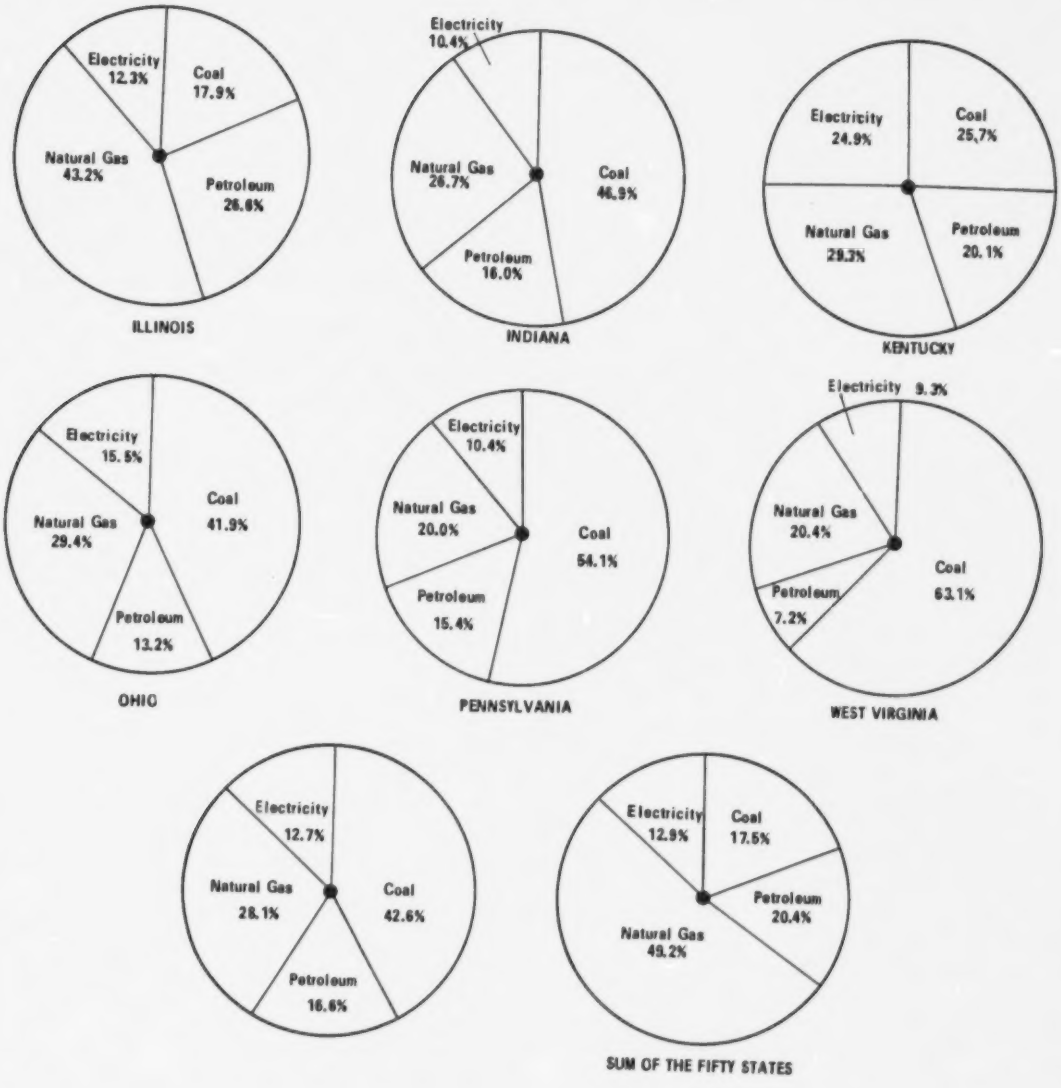

FIGURE 5. ENERGY CONSUMPTION IN THE INDUSTRIAL SECTOR, – 1975

of the impact of proposed national energy policies penalizing the use of petroleum and natural gas and encouraging the use of coal. Clearly, states like Illinois and Kentucky, where industry is currently heavily dependent upon oil and natural gas, will be the most severely impacted.

As in the residential/commercial sector, the use of natural gas by industry in the six states is important. Illinois is the most dependent on natural gas in this sector, deriving 43.2% of its industrial energy from it. Ohio and Kentucky rank second and third with 29.4% and 29.3% respectively; Indiana is fourth with 26.7%. Pennsylvania and West Virginia use somewhat smaller amounts, 20.0% and 20.4% respectively, reflecting their greater dependence on coal as an energy source.

Kentucky uses significantly more electrical energy (24.9%) in the industrial sector than any of the other states in the region or the nation as a whole. The primary reason for this is the nuclear fuel enrichment plant in Paducah, which consumes a significant amount of electrical energy. Ohio also uses a greater percentage of electrical energy in this sector (15.5%) because of the enrichment plant in Portsmouth. The effect, however, is not as pronounced as it is in Kentucky because of Ohio's greater industrial base. Industrial electrical energy use figures for the other states range from 9.3% in West Virginia to 12.3% in Illinois.

3. Transportation Sector

Nationally, the transportation sector accounts for almost one-quarter (24.7%) the total energy consumed, as shown in Figure 3. The corresponding percentages for each of the six states in the region are--Illinois, 21.2%; Indiana, 18.7%; Kentucky, 25.0%; Ohio, 19.9%; Pennsylvania, 19.0% and West Virginia, 13.6%.

Petroleum constitutes the bulk of the transportation energy consumed nationally (96.1%) and in the six states, ranging from 98.7% in Ohio to 89.6% in West Virginia.[4]

The other sources of energy used in this sector are natural gas and electricity. Natural gas in the transportation sector is used solely for pumping gas through the pipeline network; nationally, natural gas supplied 3.8% of the energy used in this sector in 1975. Kentucky and West Virginia are the only states which show a disproportionately high use of natural gas, 8.8% and 10.4% respectively, because relatively small amounts of energy are used in the transportation sector in comparison to the other ORBES states.

Use of electricity in the transportation sector accounts for about 0.5% of the total in Pennsylvania, 0.2% of the total in Illinois, and negligible amounts in the other states. This energy is used mostly for the rapid transit systems in metropolitan areas in these two states. The extensive use of public transport in the large urban areas of the states in the region and the dense forms of these areas account for the lower transportation energy consumption in the region as compared to the nation.

Energy Consumption Patterns: Fuel Source

A comparison of the distribution of energy consumption by fuel source for the six states, the six-state region and the nation is given in Figure 6. For the region as a whole, coal (41.5%) and petroleum (31.6%) constitute the major energy sources, in contrast to the U.S. where petroleum is the leading

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[4] The percentages in this section can be calculated from the Energy Consumption Pattern Tables shown in Appendix A. Since the dominant fuel in the transportation sector is petroleum, it is unnecessary to include a figure showing fuel inputs to this sector.

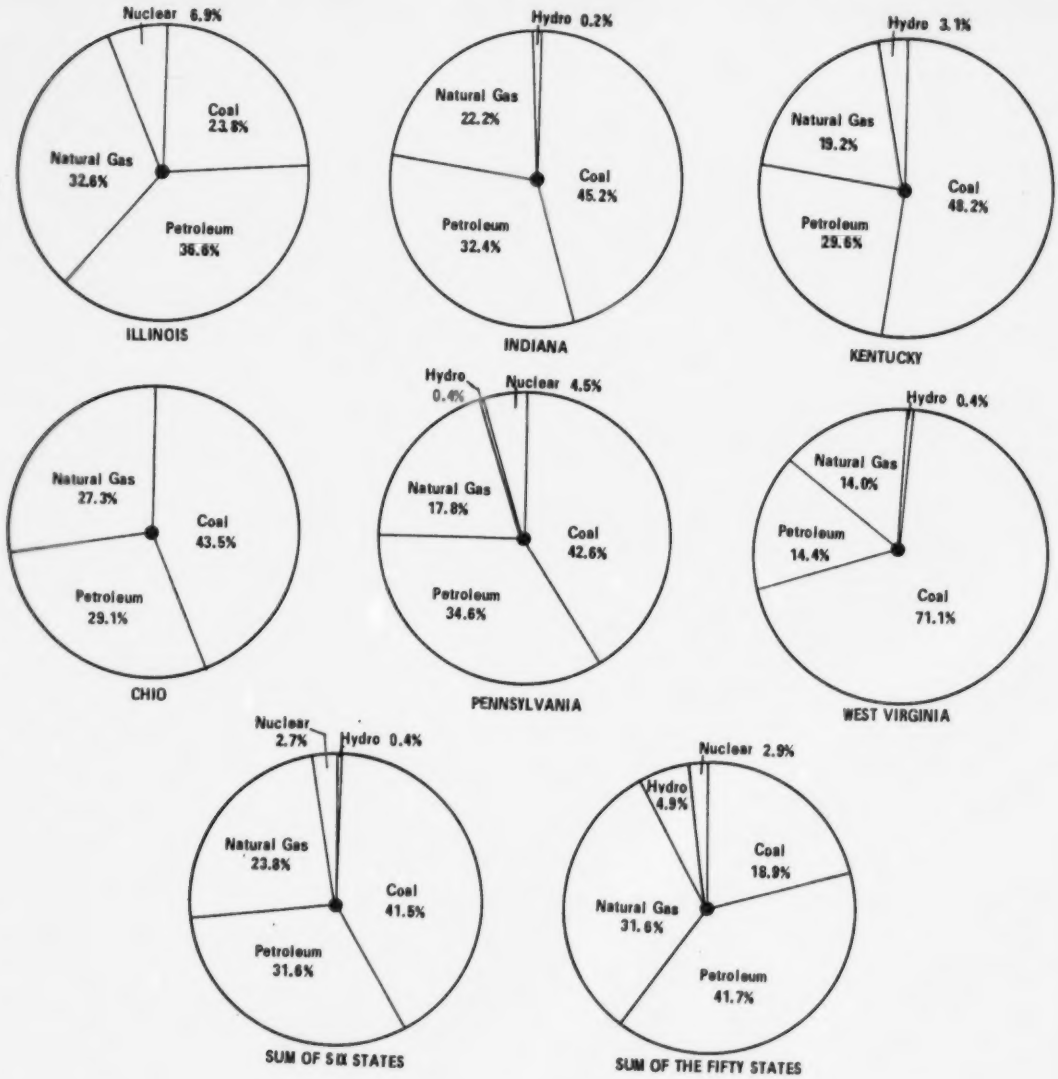

FIGURE 6. ENERGY CONSUMPTION BY SOURCE – 1975

fuel (41.7%) followed by natural gas (31.6%). The contribution of hydropower is smaller in the six-state region (0.4%) than in the U.S.(4.9%) while the use of nuclear power is approximately equal for the region and the U.S.--2.7% and 2.9% respectively.

An examination of energy consumption by fuel source for the individual states shows major differences between Illinois at the western end of the region and West Virginia in the east. Coal accounts for 71.1% of the total energy used in West Virginia but only about 23.8% in Illinois. Conversely, Illinois uses the highest percentages of petroleum (36.6%) and natural gas (32.6%) in the region while West Virginia uses the least--14.4% and 14.0% respectively. The other four states consume approximately the same percentages for each of the three fossil fuels; coal use ranges from 42.6% to 48.2%, petroleum use from 29.1% to 34.6% and natural gas use from 17.8% to 27.3%.

Clearly, the geographical location and availability of natural resources, coupled with environmental restrictions, contribute to these regional variations. For example, the use of natural gas is greatest in Illinois, Indiana, and Ohio partly because of the extensive pipeline network in these states relative to the rest of the region and partly because of environmental curbs on the use of local, high sulfur coal.

There is also a fairly wide variation among states with respect to how specific fuels, especially coal, are distributed among end use sectors. Table 2 summarizes the per cent fuel use by end use sector in 1975 for each of the six states, the six-state region and the U.S. The same information is presented graphically in Figures 7 through 10.

1. Coal

Industry consumes a higher percentage of the coal used in the six-state

Table 2. Per Cent Fuel Use By End Use Sector - 1975

	IL	IN	KY	OH	PA	W.VA	SIX-STATES	50 STATES
Coal								
Residential/Commercial	1.4	1.4	0.9	1.2	0.4	0.5	1.0	0.9
Industrial	18.4	40.8	11.9	32.7	45.7	25.9	32.7	26.0
Electric Utility	80.2	57.8	87.2	66.1	53.9	73.6	66.3	73.1
Petroleum								
Residential/Commercial	19.9	23.1	11.3	14.4	24.7	7.8	19.5	17.8
Industrial	17.8	19.4	15.2	15.4	16.1	14.6	16.8	13.6
Transportation	56.9	56.0	73.3	68.0	52.8	75.1	59.8	57.0
Electric Utility	5.4	1.5	0.2	2.2	6.4	2.5	3.9	11.6
Natural Gas								
Residential/Commercial	63.2	48.5	54.8	62.0	56.7	48.4	58.5	37.6
Industrial	32.4	47.3	34.1	36.6	40.4	42.5	37.6	43.5
Transportation	1.3	2.0	11.0	0.9	2.7	9.0	2.5	2.9
Electric Utility	3.1	2.2	0.1	0.5	0.2	0.1	1.4	16.0
Electricity								
Residential/Commercial	64.1	48.8	37.6	46.3	52.4	48.7	51.5	60.8
Industrial	35.5	51.2	62.4	53.7	46.5	51.3	48.1	38.9
Transportation	0.4				1.0		0.4	0.3

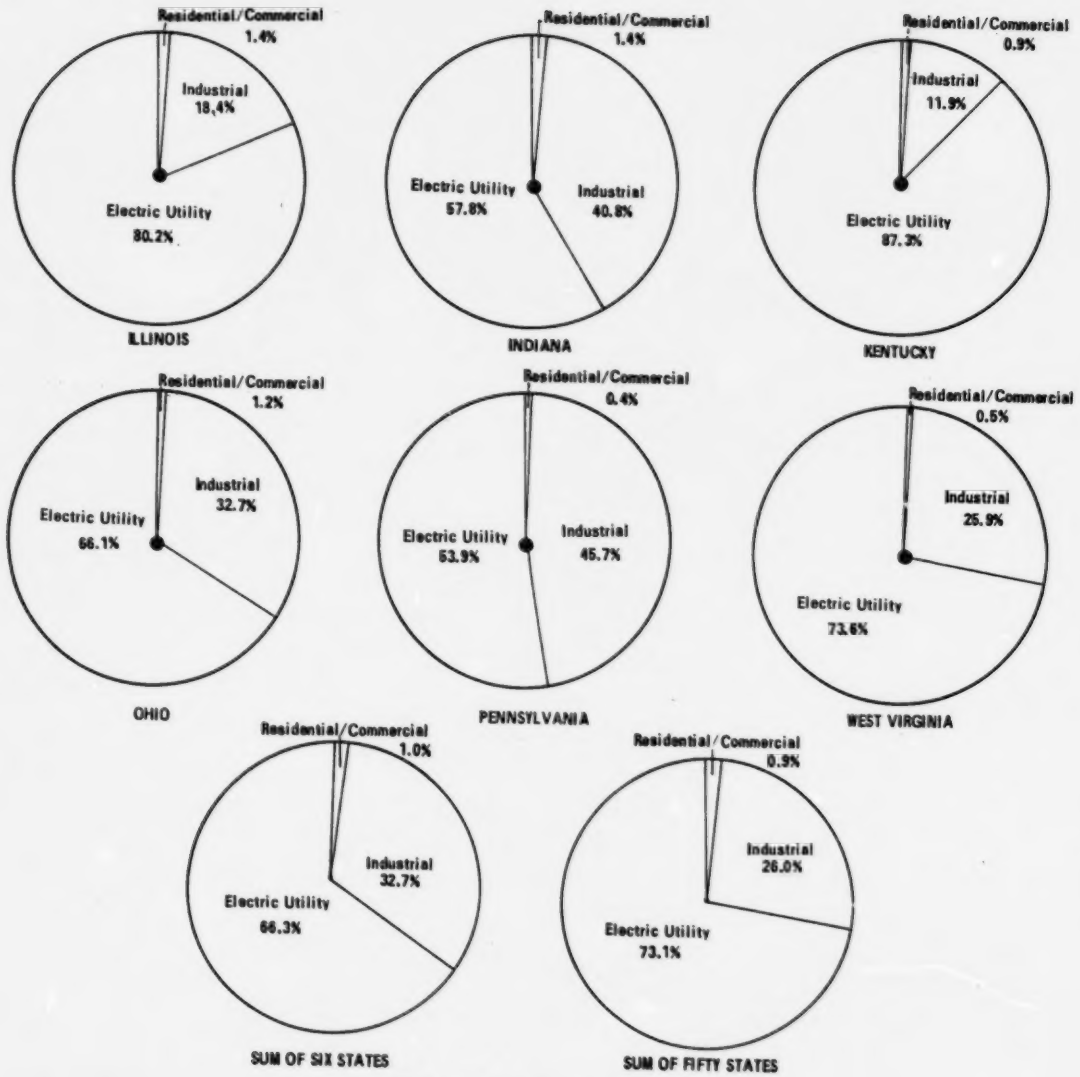

FIGURE 7. END USES OF COAL – 1975

region (32.7%) than it does nationwide (26.0%), primarily because of the energy-intensive industries located throughout the region. Figure 7 shows that Illinois and Kentucky use a small percentage of their total coal consumption in industry, 18.4% and 11.9% respectively. Pennsylvania uses 45.7% of its coal for industry; Indiana, 40.8%; Ohio, 32.7% and West Virginia, 25.9%. The remaining portion of coal is used for electric power generation, with negligible amounts consumed in the residential/commercial sector.

2. Petroleum

The majority of the nation's, region's and six individual state's petroleum is consumed in the transportation sector. Electric power generation consumes 11.6% of the total U.S. petroleum, whereas the region uses only 3.9% of its petroleum for this purpose. Figure 8 shows that Pennsylvania and Indiana use 24.7% and 23.1% respectively of their total petroleum in the residential/commercial sector. West Virginia (7.8%) and Kentucky (11.3%) use significantly smaller proportions. Illinois and Ohio fall in between, using 19.9% and 14.4% respectively.

3. Natural Gas

The six-state region devotes the greatest percentage of its natural gas to the residential/commercial sector--58.5%. By comparision, the U.S. uses only 37.6% of its natural gas in this sector. The region commits a smaller percentage of its natural gas to the production of electric power (1.4%) than does the U.S. as a whole (16.0%). In each state, the major portion of natural gas is consumed in the residential/commercial sector (Figure 9). Illinois and Ohio utilize a greater proportion of their natural gas in this sector than the other states--63.2% and 62.0% respectively as compared to 48.4% for West Virginia, 48.5% for Indiana, 54.8% for Kentucky and 56.7% for Pennsylvania. The share of natural gas used in the industrial sector ranges

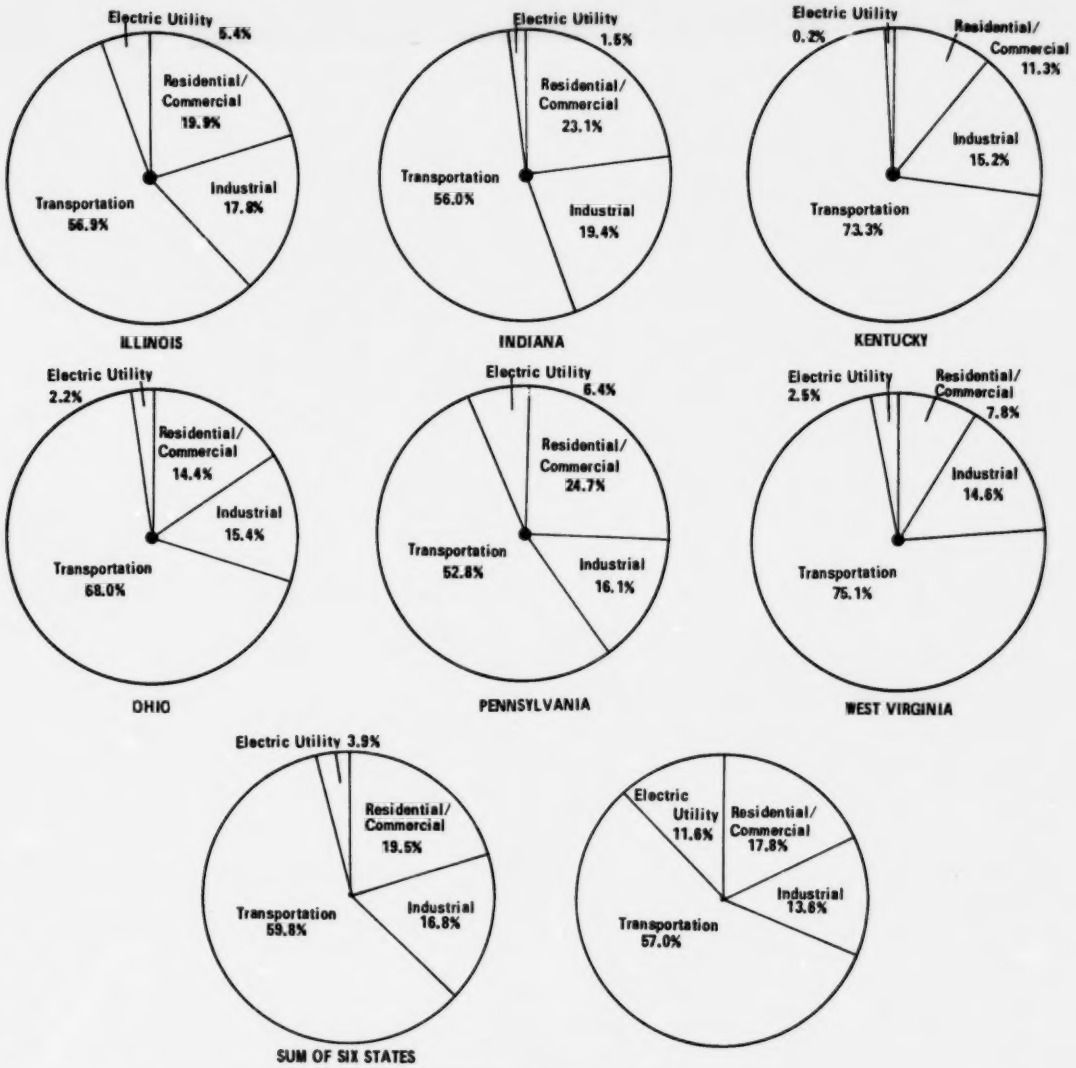

FIGURE 8. END USES OF PETROLEUM – 1975

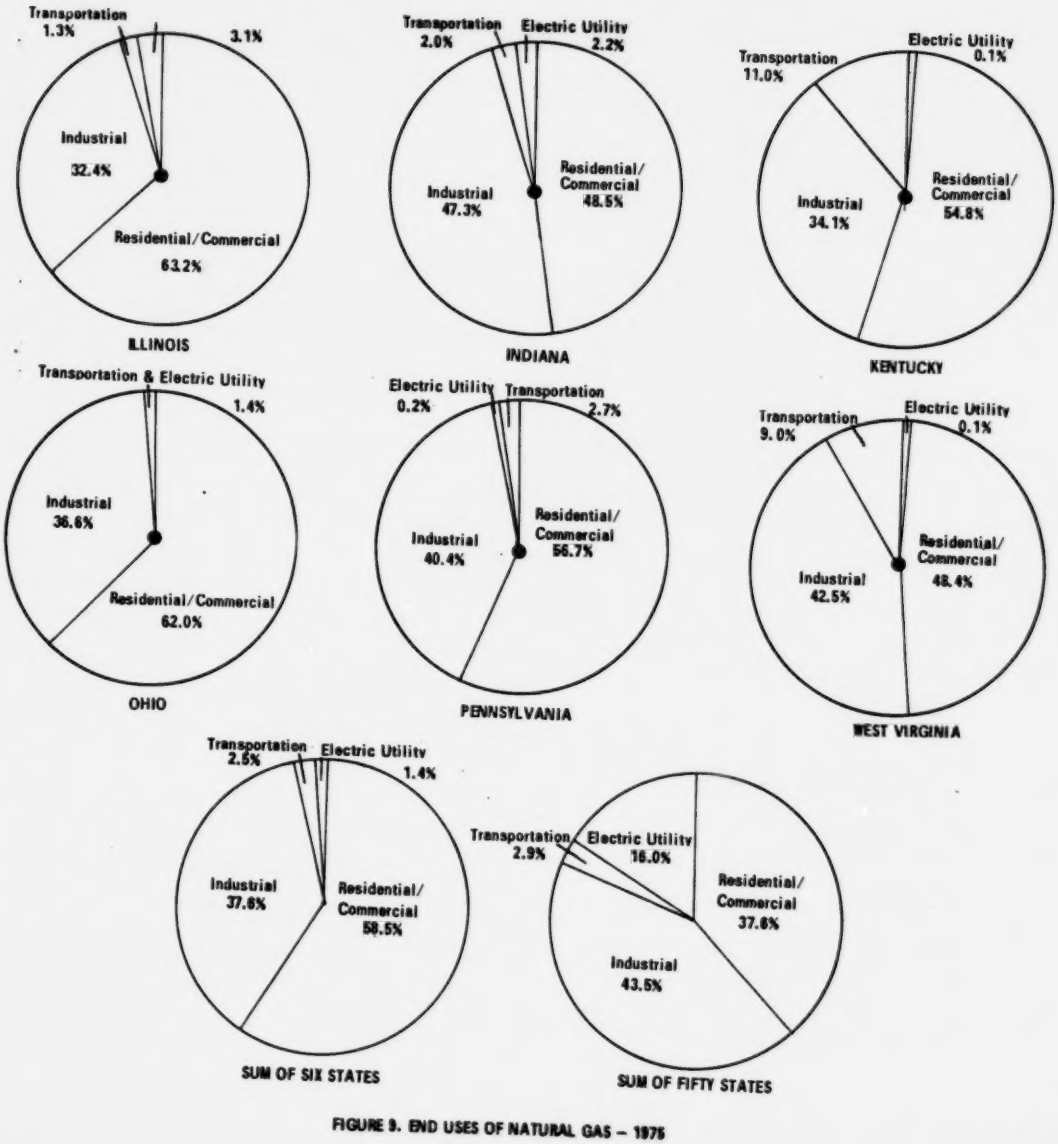

FIGURE 9. END USES OF NATURAL GAS – 1975

from 32.4% in Illinois to 47.3% in Indiana. Very small percentages of the total natural gas consumed in each state are used in the transportation and electric utility sectors.

4. End-Use Electricity

There are differences in the way the U.S. and the six-state region utilize electricity. While the bulk of it goes to the residential/commercial sector, a larger percentage is consumed in the residential/commercial sector nationwide (60.8%) than in the region (51.5%). Conversely, 48.1% of the electricity goes to the industrial sector in the region while only 38.9% is used by industry in the U.S. Electricity is used primarily in the residential/commercial and industrial sectors in all the states as well, with very small amounts used for transportation in Illinois, and Pennsylvania (Figure 10). Illinois uses the greatest portion of its electricity in the residential/commercial sector (64.1%) and Kentucky uses the least (37.6%).

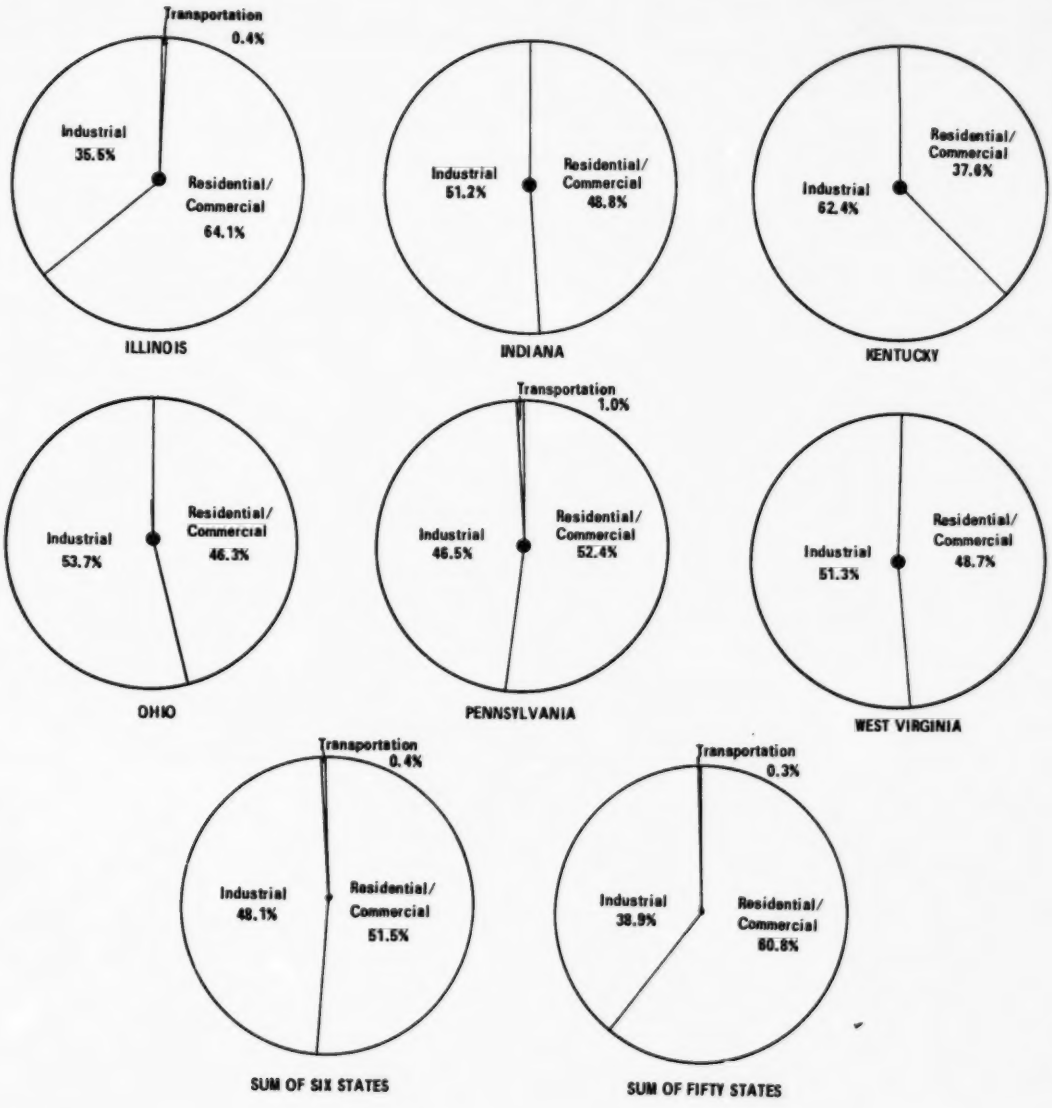

FIGURE 10. END USES OF ELECTRICITY – 1975

IV. ELECTRIC POWER GENERATION

Coal is the major fuel source for the generation of electrical power in the six-state region. Figure 11 shows that 85.5% of the energy used to generate electricity in the region is supplied by coal, while the comparable figure for the U.S. is only 43.9%. On the national level, hydropower and nuclear power provide 15.5% and 9.1% respectively of the energy inputs to power generation, but only 1.3% of the electricity generated in the six state region comes from hydropower and 8.3% from nuclear power. Petroleum and natural gas provide only small amounts of fuel for electric power generation in the region (3.8% and 1.1% respectively, but are much more significant on the national level (15.4% for petroleum and 16.1% for natural gas).

On a state-by-state basis, Figure 11 shows that West Virginia (98.3%), Ohio (97.3%), Indiana (95.7%) and Kentucky (92.9%) far outdistance Pennsylvania (76.2%) and Illinois (65.7%) in the percentage of coal used for the production of electric power. These last two are the only states in the region to have a portion of their electrical power generated from nuclear fuel. In Pennsylvania and Illinois hydropower contributes 1.4% and 0.1% respectively, while nuclear power contributes 14.9% and 23.8% respectively of the energy input to this sector. Kentucky has some hydropower from which it derives 6.9% of its electrical energy. Indiana and West Virginia each have a small amount, equivalent to 0.8% of their total input. Ohio has a negligible amount.

Petroleum contributes 6.8% of the electric energy fuel requirements in

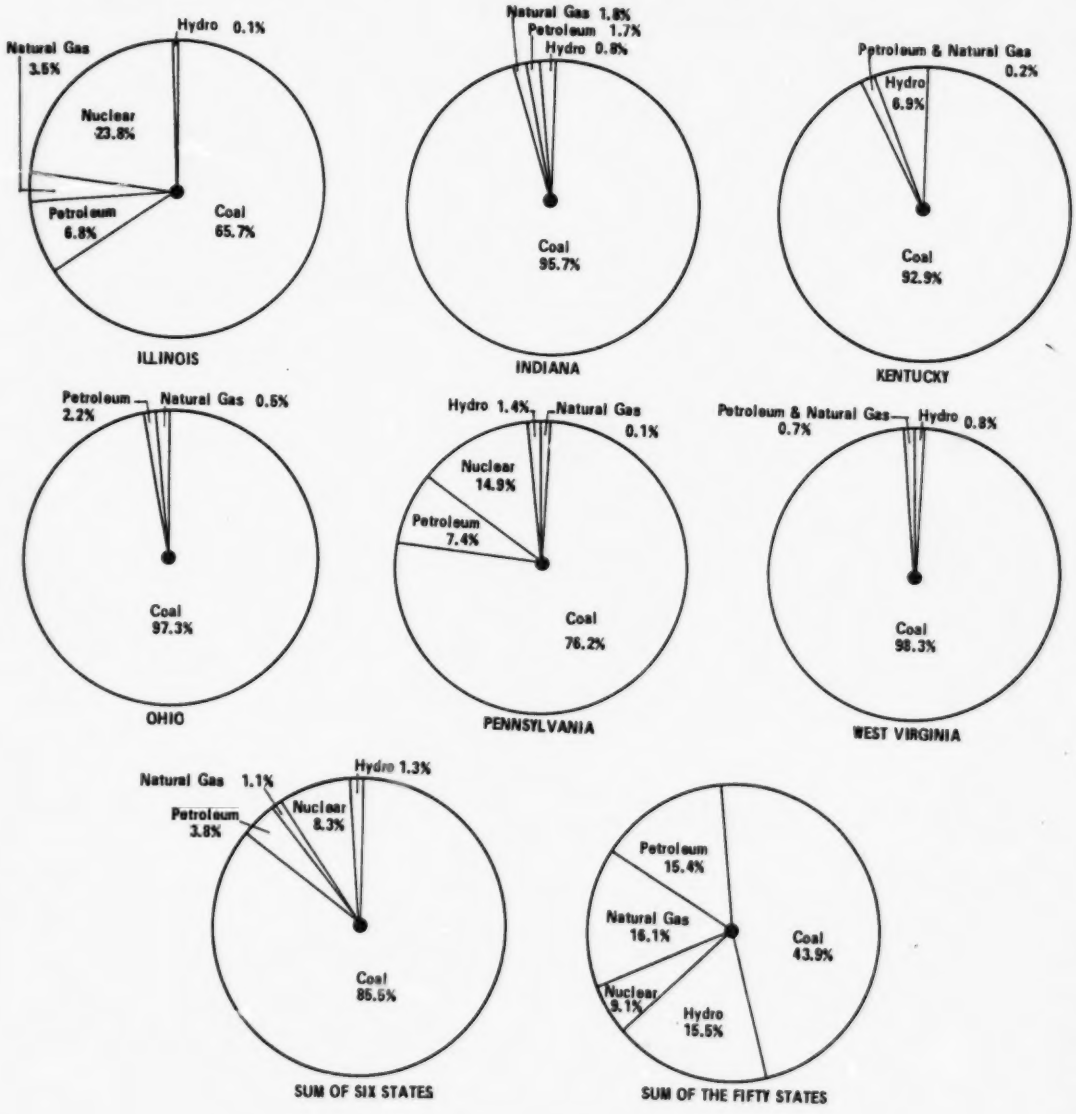

FIGURE 11. PRIMARY ENERGY INPUTS TO THE ELECTRIC POWER SECTOR – 1975

Illinois; 1.7% in Indiana; 2.2% in Ohio; and 7.4% in Pennsylvania. Petroleum and natural gas combined account for only a fraction of one per cent in West Virginia and Kentucky. In fact, with the exception of Illinois (10.3%) and Pennsylvania (7.5%) the combined use of petroleum and natural gas is minor in the six-state region.

In 1975, Indiana, Kentucky, Pennsylvania, and West Virginia were net exporters of electricity, whereas Illinois and Ohio were net importers. The figures in Table 3 show that in 1975 Indiana and Pennsylvania exported 4.7 trillion Btu and 29.9 trillion Btu of electricity, representing 2.3% and 8.1% of the total produced in each state. Illinois and Ohio, on the other hand, imported 2.1% and 10.8% of their electric power requirements, respectively.

Kentucky and West Virginia are major exporters of electricity. In 975 1975 Kentucky exported 55.4 trillion Btu of electrical energy, 31.8% of the electricity generated in the state and more than was used in the residential/commercial sector. West Virginia exported 128.4 trillion Btu, 61.3% of the total generated, using only 60.4 trillion Btu within the state. These exports distort all the energy consumption patterns for both states. This problem does not arise in the other four states because the exported electricity represents only a small fraction of the total energy use.

Table 3. Exported and Imported Electricity - 1975

	Total Primary Fuel Inputs to Electric Power Sector	Electricity Generated	In-State Use of Electricity[1]	Exports/Imports[2]
Illinois	997.5	316.5	291.3	-6.1
Indiana	605.5	202.6	177.9	4.7
Kentucky	517.1	174.4	101.7	55.4
Ohio	1,065.9	350.0	353.5	-38.2
Pennsylvania	1,133.0	369.3	302.5	30.2
West Virginia	608.5	209.5	60.4	128.4

[1]Does not include lost or unaccounted for electricity

[2]Negative figures for Illinois and Ohio indicate imported electricity; figures for the other states indicate exported electricity.

V. CONCLUSION

The preceding sections have analyzed 1975 energy consumption patterns for the nation and the six ORBES states. Preliminary estimates of total U.S. energy consumption in 1976 and 1977 and forecasts for 1978 are now available. These figures are used to analyze trends and estimate state energy use for these years.

Total U.S. energy consumption increased from $69{,}908.5 \times 10^{12}$ Btu in 1975 to $74{,}330 \times 10^{12}$ Btu in 1976, an annual growth rate of 6.3%. By comparison, the growth rate was -3.8% from 1974 to 1975. This indicates that national energy consumption is increasing again after the temporary decline in energy use following the oil crisis and the economic recession. This is clearly seen in Figure 12, which shows trends in U.S. energy consumption for the period 1974-1978.

The percentage source and sector breakdowns of total energy consumption at the national level are similar for 1975 and 1976. In 1976 there are small percentage increases in the use of coal and petroleum and a decrease in the use of natural gas (Figure 1).

Table 4 shows that the per cent contribution of individual states to total U.S. energy consumption remained essentially constant from 1974 to 1975. In 1975 the ORBES states accounted for 21.6% of total U.S. energy consumption; the corresponding figures for the individual states were: Illinois, 4.9%; Indiana,

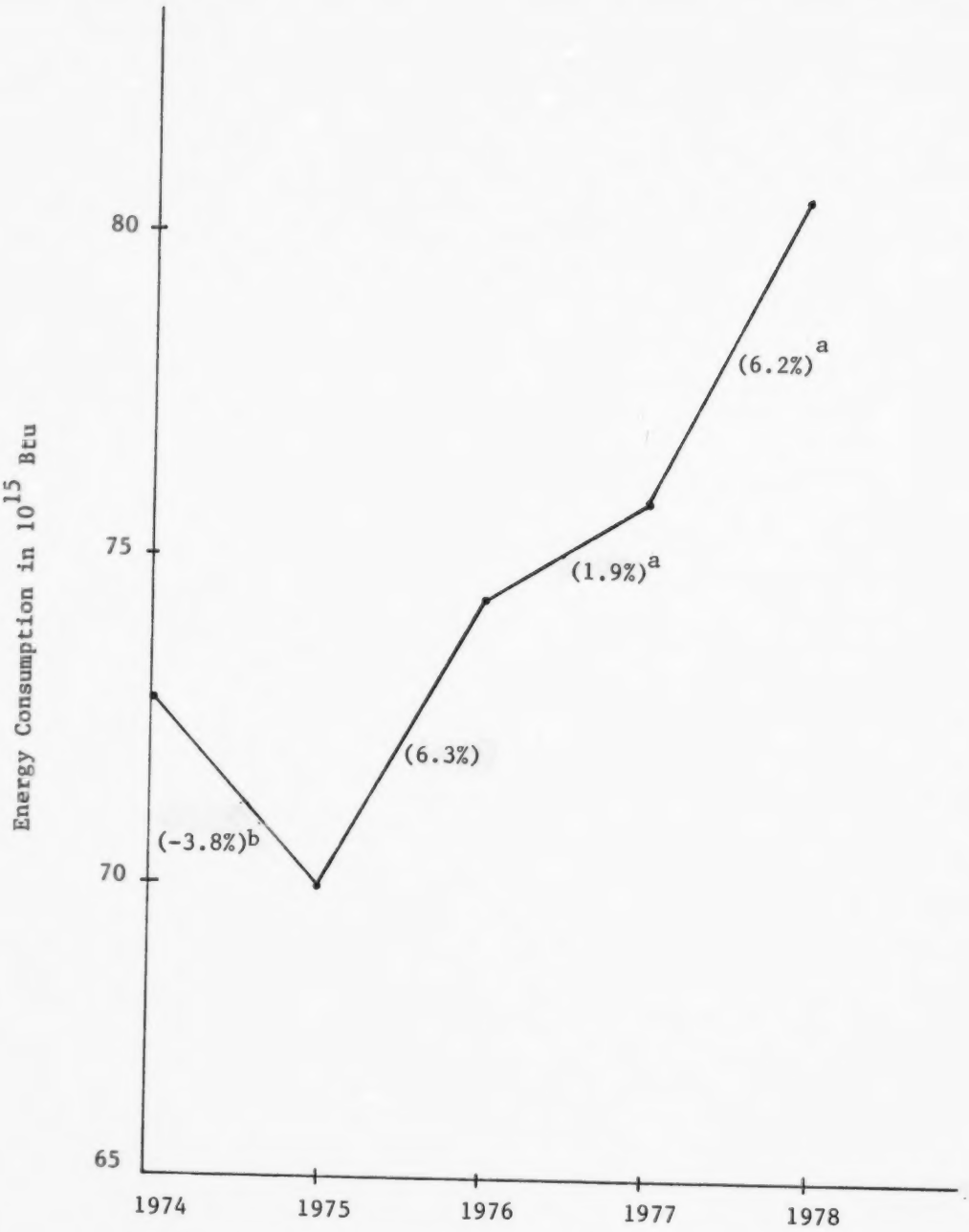

FIGURE 12. U.S. ENERGY CONSUMPTION: 1974-1978

[a] Figure for 1977 and 1978 are U.S. Department of Energy and Institute of Gas Technology estimates respectively.

[b] Figures in parentheses indicate per cent change.

Table 4. Energy Consumed in the Total U.S. and the ORBES States: 1974 - 1978

	1974	1975	1976[1,3]	1977[1,3]	1978[2,3]
United States	72,713.6	69,908.5	74,330	75,750	80,460
Six-State Region	15,678.8 21.6%	15,125.6 21.6%	16,055	16,362	17,379
Illinois	3,517.9 4.8%	3,442.4 4.9%	3,642	3,712	3,943
Indiana	2,264.3 3.1%	2,212.9 3.2%	2,379	2,424	2,575
Kentucky	1,163.8 1.6%	1,088.1 1.6%	1,189	1,212	1,287
Ohio	3,816.3 5.2%	3,641.5 5.2%	3,865	3,939	4,184
Pennsylvania	3,829.3 5.3%	3,724.5 5.3%	3,939	4,015	4,264
West Virginia	1,087.2 1.5%	1,016.1 1.5%	1,115	1,136	1,207

[1]U.S. figures for 1976 and 1977 from: Monthly Energy Review, U.S. Department of Energy, Energy Information Administration, Washington, D.C. (June, 1978), p. 2.

[2]U.S. figure for 1978 is a forecast from: J. D. Parent and H. R. Linden, "IGT predicts moderate increase in U.S. energy consumption in 1978," Institute of Gas Technology, Chicago (December 20, 1977).

[3]State figures for 1976, 1977, and 1978 are estimates based on total U.S. consumption in those years and percent contribution of individual states to U.S. total in 1975.

3.2%; Kentucky, 1.6%; Ohio, 5.2%; Pennsylvania, 5.3% and West Virginia 1.5%. The per cent figures for 1975 are used to estimate energy consumption in the six-state region and in each of the ORBES states for the years 1976, 1977 and 1978.

It is emphasized here that state (or national) energy data should not be used alone for extrapolation into the future. Energy use during the period immediately following the oil embargo of 1974 decreased at both the state and national level. The decline was temporary however, as shown in the national figures for 1976 and 1977. Therefore, in Table 4, state estimates of future energy use are derived from national figures and not from extrapolation of historical state data

APPENDIX A

ENERGY CONSUMPTION PATTERN TABLES

1975

TABLE A1 ENERGY CONSUMPTION PATTERN - ILLINOIS, 1975 (10^{12} BTU)

SOURCE / SECTOR	Coal	Petroleum Products	Natural Gas	Hydro	Nuclear	Total Primary Fuels	Electricity	Total Energy Inputs	Percentage
Residential/ Commercial	11.5	250.9	708.9			971.3	186.7	1,158.0	33.6
Industrial	150.1	223.9	363.2			737.2	103.5	840.7	24.4
Transportation		715.8	14.5			730.3	1.1	731.4	21.2
Electric Utility	655.7	67.6	35.2	1.1	237.9	997.5	Generation 316.5	Waste Heat 681.0	19.8
Other							In-State Use 291.3	Lost&Unacc. 31.3	0.9
Total Source Consumption	817.3	1,258.2	1,121.8	1.1	237.9	Total 3,436.3	Imports 6.1	Grand Total 3,442.4	100.0
Percentage	23.8	36.6	32.6	0	6.9	100.0			

TABLE A2 ENERGY CONSUMPTION PATTERN - INDIANA, 1975 (10^{12} BTU)

SOURCE / SECTOR	Coal	Petroleum Products	Natural Gas	Hydro	Nuclear	Total Primary Fuels	Electricity	Total Energy Inputs	Percentage
Residential/ Commercial	13.8	166.5	238.3			418.6	86.8	505.4	22.8
Industrial	408.7	139.4	232.7			780.8	91.0	871.8	39.4
Transportation		402.9	9.8			412.7	0.1	412.8	18.7
Electric Utility	579.4	10.5	11.0	4.6		605.5	Generation 202.6	Waste Heat 402.9	18.2
Other							In-State Use 177.9	Lost&Unacc. 20.0	0.9
Total Source Consumption	1,001.9	719.3	491.8	4.6		Total 2,217.6	Exports 4.7	Grand Total 2,212.9	100.0
Percentage	45.2	32.4	22.2	0.2		100.0			

TABLE A3 : ENERGY CONSUMPTION PATTERN - KENTUCKY, 1975 (10^{12} BTU)

SOURCE / SECTOR	Coal	Petroleum Products	Natural Gas	Hydro	Nuclear	Total Primary Fuels	Electricity	Total Energy Inputs	Percentage
Residential/ Commercial	4.8	38.3	120.1			163.2	38.2	201.4	18.5
Industrial	65.4	51.3	74.7			191.4	63.5	254.9	23.4
Transportation		247.8	24.0			271.8		271.8	25.0
Electric Utility	480.5	0.6	0.3	35.7		517.1	Generation 174.4	Waste Heat 342.7	31.5
Other							In-State Use 101.7	Lost&Unacc. 17.3	1.6
Total Source Consumption	550.7	338.0	219.1	35.7		Total 1,143.5	Exports 55.4	Grand Total 1,088.1	100.0
Percentage	48.2	29.6	19.2	3.1		100.0			

TABLE A4 : ENERGY CONSUMPTION PATTERN - OHIO, 1975 (10^{12} BTU)

SOURCE / SECTOR	Coal	Petroleum Products	Natural Gas	Hydro	Nuclear	Total Primary Fuels	Electricity	Total Energy Inputs	Percentage
Residential/ Commercial	18.3	151.0	609.7			779.0	163.7	942.7	25.9
Industrial	513.2	161.8	360.3			1,035.3	189.7	1,225.0	33.6
Transportation		714.0	9.2			723.2	0.1	723.3	19.9
Electric Utility	1,037.2	23.4	5.2	0.1		1,065.9	Generation 350.0	Waste Heat 715.9	19.7
Other							In-State Use 353.5	Lost&Unacc. 34.7	0.9
Total Source Consumption	1,568.7	1,050.2	984.4	0.1		Total 3,603.4	Imports 38.2	Grand Total 3,641.6	100.0
Percentage	43.5	29.1	27,3			100.0			

TABLE A5 : ENERGY CONSUMPTION PATTERN - PENNSYLVANIA, 1975 (10^{12} BTU)

SOURCE / SECTOR	Coal	Petroleum Products	Natural Gas	Hydro	Nuclear	Total Primary Fuels	Electricity	Total Energy Inputs	Percent-age
Residential/ Commercial	5.8	321.3	379.5			706.6	158.6	865.2	23.2
Industrial	732.0	208.6	270.8			1,211.4	140.8	1,352.2	36.3
Transporta-tion		685.6	18.1			703.7	3.4	707.1	19.0
Electric Utility	863.4	82.8	1.2	16.4	169.2	1,133.0	Generation 369.3	Waste Heat 763.7	20.5
Other							In-State Use 302.8	Lost&Unacc. 36.6	1.0
Total Source Consumption	1,601.2	1,298.3	669.6	16.4	169.2	Total 3,754.7	Exports 29.9	Grand Total 3,724.8	100.0
Percentage	42.6	34.6	17.8	0.4	4.5	100.0			

TABLE A6 : ENERGY CONSUMPTION PATTERN - WEST VIRGINIA, 1975 (10^{12} BTU)

SOURCE / SECTOR	Coal	Petroleum Products	Natural Gas	Hydro	Nuclear	Total Primary Fuels	Electricity	Total Energy Inputs	Percent-age
Residential/ Commercial	4.2	12.8	77.7			94.7	29.4	124.1	12.2
Industrial	210.8	24.1	68.1			303.0	31.0	334.0	32.9
Transporta-tion		123.9	14.4			138.3		138.3	13.6
Electric Utility	599.2	4.2	0.2	4.9		608.5	Generation 209.5	Waste Heat 399.0	39.3
Other							In-State Use 60.4	Lost&Unacc. 20.7	2.0
Total Source Consumption	814.2	165.0	160.4	4.9		Total 1,144.5	Exports 128.4	Grand Total 1,016.1	100.0
Percentage	71.1	14.4	14.0	0.4		100.0			

TABLE A7 : ENERGY CONSUMPTION PATTERN - SUM OF SIX STATES, 1975 (10^{12} BTU)

SOURCE / SECTOR	Coal	Petroleum Products	Natural Gas	Hydro	Nuclear	Total Primary Fuels	Electricity	Total Energy Inputs	Percentage
Residential/ Commercial	58.4	940.8	2,134.2			3,133.4	663.4	3,796.8	25.1
Industrial	2,080.2	809.1	1,369.8			4,259.1	619.5	4,878.6	32.3
Transportation		2,890.0	90.0			2,980.0	4.7	2,984.7	19.7
Electric Utility	4,215.4	189.1	53.1	62.8	407.1	4,927.5	Generation 1,622.3	Waste Heat 3,305.2	21.8
Other							Regional Use 1,287.6	Lost&Unacc. 160.6	1.1
Total Source Consumption	6,354.0	4,829.0	3,647.1	62.8	407.1	Total 15,300.0	Exports 174.1	Grand Total 15,125.9	100.0
Percentage	41.5	31.6	23.8	0.4	2.7	100.0			

TABLE A8 : ENERGY CONSUMPTION PATTERN, SUM OF FIFTY STATES - 1975 (10^{12} BTU)

SOURCE / SECTOR	Coal	Petroleum Products	Natural Gas	Hydro	Nuclear	Total Primary Fuels	Electricity	Total Energy Inputs	Percentage
Residential/ Commercial	110.1	4,740.0	7,588.5			12.438.6	3.598.1	16,036.7	25.1
Industrial	3,135.9	3,643.2	8,786.7			15,565.8	2,304.0	17,869.8	27.9
Transportation		15,201.4	595.2			15,796.6	14.6	15,811.2	24.7
Electric Utility	8,828.7	3,103.7	3,233.4	3,122.3	1,838.9	20,127.0	Generation 6,543.0	Waste Heat 13,584.0	21.2
Other							Dom. Use 5,916.7	Lost&Unacc. 647.4	1.0
Total Source Consumption	12,074.7	26,688.3	20,203.8	3,122.3	1,838.9	Total 63,928.0	Imports 21.1	Grand Total 63,949.1	100.0
Percentage	18.9	41.7	31.6	4.9	2.9	100.0			

TABLE A9 : ENERGY CONSUMPTION PATTERN, U.S. TOTAL - 1975 (10^{12} BTU)

SOURCE / SECTOR	Coal	Petroleum Products	Natural Gas	Hydro	Nuclear	Total Primary Fuels	Electricity	Total Energy Inputs	Percentage
Residential/ Commercial	220.1[a]	4,746.1[d]	7,588.5			12,554.7	3,598.1	16,152.8	23.1
Industrial	3,361.0[b]	7,544.5[e]	8,786.7			19,692.2	2,304.0	21,996.2	31.5
Transportation	0.5[c]	16,917.8[f]	595.2			17,513.5	14.6	17,528.1	25.1
Electric Utility	8,828.7	3,103.7	3,233.4	3,122.3	1,838.9	20,127.0	Generation 6,543.0	Waste Heat 13,584.0	19.4
Other							Dom. Use 5,916.7	Lost&Unacc. 647.4	0.9
Total Source Consumption	12,410.3	32,312.1	20,203.8	3,122.3	1,838.9	Total 69,887.4	Imports 21.1	Grand Total 69,908.5	100.0
Percentage	17.8	46.2	28.9	4.5	2.6	100.0			

Footnotes to tables A8 and A9 (Sum of Fifty States and U.S. Total)

[a]Includes small amounts of anthracite coal

[b]Includes small amount of anthracite coal; does not include imported coke

[c]Includes coal used by bunker lake vessels

[d]Includes imported kerosine

[e]Includes LPG and ethane for chemical and synthetic rubber manufacture and imported distillate and residual oils

[f]Includes imported distillate and residual oils for bonded bunker use, distillate and residual oils used by the military, and non-military use of aviation turbine fuel

APPENDIX B

ENERGY CONSUMPTION PATTERN TABLES

1974

TABLE B1: ENERGY CONSUMPTION PATTERN - ILLINOIS, 1974 (10^{12} BTU)

SOURCE / SECTOR	Coal	Petroleum Products	Natural Gas	Hydro	Nuclear	Total Primary Fuels	Electricity	Total Energy Inputs	Percentage
Residential/ Commercial	17.6	247.1	694.1			958.8	183.2	1,142.0	32.5
Industrial	169.6	232.2	432.7			834.5	110.1	944.6	26.8
Transportation		706.3	19.5			725.8	1.1	726.9	20.7
Electric Utility	660.0	73.5	44.6	1.1	208.9	988.1	Generation 312.1	Waste Heat 676.0	19.2
Other							In-State Use 294.4	Lost&Unacc. 28.4	0.8
Total Source Consumption	847.2	1,259.1	1,190.9	1.1	208.9	Total 3,507.2	Imports 10.7	Grand Total 3,517.9	100.0
Percentage	24.2	35.9	34.0	0	6.0	100.0			

TABLE B2: ENERGY CONSUMPTION PATTERN - INDIANA, 1974 (10^{12} BTU)

SOURCE / SECTOR	Coal	Petroleum Products	Natural Gas	Hydro	Nuclear	Total Primary Fuels	Electricity	Total Energy Inputs	Percentage
Residential/ Commercial	9.2	166.2	239.6			415.0	84.4	499.4	22.0
Industrial	422.5	165.7	279.3			867.5	80.4	947.9	41.9
Transportation		400.2	12.8			413.0	0.1	413.1	18.2
Electric Utility	545.8	15.9	14.0	4.6		580.3	Generation 194.0	Waste Heat 386.3	17.1
Other							In-State Use 164.9	Lost&Unacc. 17.6	0.8
Total Source Consumption	977.5	748.0	545.7	4.6		Total 2,275.8	Exports 11.5	Grand Total 2,264.3	100.0
Percentage	43.0	32.9	24.0	0.2		100.0			

TABLE B3: ENERGY CONSUMPTION PATTERN - KENTUCKY, 1974 (10^{12} BTU)

SOURCE / SECTOR	Coal	Petroleum Products	Natural Gas	Hydro	Nuclear	Total Primary Fuels	Electricity	Total Energy Inputs	Percentage
Residential/ Commercial	6.8	39.0	121.3			167.1	45.8	212.9	18.3
Industrial	88.3	48.1	83.4			219.8	90.8	310.6	26.7
Transportation		239.3	30.1			269.4		269.4	23.1
Electric Utility	494.7	1.1	5.7	35.5		537.0	Generation 182.7	Waste Heat 354.3	30.4
Other							In-State Use 136.6	Lost&Unacc. 16.6	1.4
Total Source Consumption	589.8	327.5	240.5	35.5		Total 1,193.3	Exports 29.5	Grand Total 1,163.8	100.0
Percentage	49.4	27.5	20.2	3.0		100			

TABLE B4: ENERGY CONSUMPTION PATTERN - OHIO, 1974 (10^{12} BTU)

SOURCE / SECTOR	Coal	Petroleum Products	Natural Gas	Hydro	Nuclear	Total Primary Fuels	Electricity	Total Energy Inputs	Percentage
Residential/ Commercial	27.8	134.7	643.5			806.0	181.5	987.5	25.9
Industrial	598.7	156.3	454.0			1,209.0	181.7	1,390.7	36.4
Transportation		705.5	10.3			715.8	0.1	715.9	18.8
Electric Utility	973.0	32.7	20.9	0.1		1,026.7	Generation 335.0	Waste Heat 691.7	18.1
Other							In-State Use 363.3	Lost&Unacc. 30.5	0.8
Total Source Consumption	1,599.5	1,029.2	1,128.7	0.1		Total 3,757.5	Imports 58.8	Grand Total 3,816.3	100.0
Percentage	42.6	27.4	30.0			100.0			

TABLE B5: ENERGY CONSUMPTION PATTERN - PENNSYLVANIA, 1974 (10^{12}BTU)

SOURCE / SECTOR	Coal	Petroleum Products	Natural Gas	Hydro	Nuclear	Total Primary Fuels	Electricity	Total Energy Inputs	Percentage
Residential/ Commercial	7.6	344.6	383.3			735.5	148.6	884.1	23.1
Industrial	764.9	240.0	322.6			1,327.5	156.5	1,484.0	38.7
Transportation		687.7	21.4			709.1	3.1	712.2	18.6
Electric Utility	817.4	141.1	8.1	14.5	74.6	1,055.7	Generation 337.4	Waste Heat 718.3	18.8
Other							In-State Use 308.2	Lost&Unacc. 30.7	0.8
Total Source Consumption	1,589.9	1,413.4	735.4	14.5	74.6	Total 3,827.8	Imports 1.5	Grand Total 3,829.3	100.0
Percentage	41.5	36.9	19.2	0.4	1.9	100.0			

TABLE B6: ENERGY CONSUMPTION PATTERN - WEST VIRGINIA, 1974 (10^{12} BTU)

SOURCE / SECTOR	Coal	Petroleum Products	Natural Gas	Hydro	Nuclear	Total Primary Fuels	Electricity	Total Energy Inputs	Percentage
Residential/ Commercial	8.8	8.2	80.3			97.3	31.1	128.4	11.8
Industrial	252.7	18.5	113.0			384.2	34.8	419.0	38.5
Transportation		116.4	16.1			132.5		132.5	12.2
Electric Utility	585.8	6.9	0.4	5.0		598.1	Generation 209.9	Waste Heat 388.2	35.7
Other							In-State Use 65.9	Lost&Unacc. 19.1	1.8
Total Source Consumption	847.3	150.0	209.8	5.0		Total 1,212.1	Exports 124.9	Grand Total 1,087.2	100.0
Percentage	69.9	12.4	17.3	0.4		100.0			

TABLE B7: ENERGY CONSUMPTION PATTERN - SUM OF SIX STATES, 1974 (10^{12}BTU)

SOURCE / SECTOR	Coal	Petroleum Products	Natural Gas	Hydro	Nuclear	Total Primary Fuels	Electricity	Total Energy Inputs	Percentage
Residential/ Commercial	77.8	939.8	2,162.1			3,179.7	674.6	3,854.3	24.6
Industrial	2,296.7	860.8	1,685.0			4,842.5	654.3	5,496.8	35.1
Transportation		2,855.4	110.2			2,965.6	4.4	2,970.0	18.9
Electric Utility	4,076.7	271.2	93.7	60.8	283.5	4,785.9	Generation 1,571.1	Waste Heat 3,214.8	20.5
Other							Regional Use 1,333.3	Lost&Unacc. 142.9	0.9
Total Source Consumption	6,451.2	4,927.2	4,051.0	60.8	283.5	Total 15,773.7	Exports 94.9	Grand Total 15,678.8	100.0
Percentage	40.9	31.2	25.7	0.4	1.8	100.0			

TABLE B8: ENERGY CONSUMPTION PATTERN - SUM OF FIFTY STATES - 1974 (10^{12} BTU)

SOURCE / SECTOR	Coal	Petroleum Products	Natural Gas	Hydro	Nuclear	Total Primary Fuels	Electricity	Total Energy Inputs	Percentage
Residential/ Commercial	151.3	4,933.2	7,517.8			12,602.3	3,483.0	16,085.3	24.5
Industrial	3,432.1	3,937.6	10,313.8			17,683.5	2,336.8	20,020.3	30.5
Transportation		14,884.9	684.8			15,569.7	14.5	15,584.2	23.8
Electric Utility	8,531.2	3,284.2	3,525.1	3,143.5	1,210.7	19,694.7	Generation 6,368.2	Waste Heat 13,326.5	20.3
Other							Dom. Use 5,834.3	Lost&Unacc. 577.2	0.9
Total Source Consumption	12,114.6	27,039.9	22,041.5	3,143.5	1,210.7	Total 65,550.2	Imports 43.3	Grand Total 65,593.5	100.0
Percentage	18.5	41.3	33.6	4.8	1.8	100.0			

TABLE B9: ENERGY CONSUMPTION PATTERN, U.S. TOTAL - 1974 (10^{12} BTU)

SOURCE / SECTOR	Coal	Petroleum Products	Natural Gas	Hydro	Nuclear	Total Primary Fuels	Electricity	Total Energy Inputs	Percentage
Residential/ Commercial	269.3[a]	4,943.1[d]	7,517.8			12,730.2	3,483.0	16,213.2	22.3
Industrial	3,581.2[b]	8,969.9[e]	10,313.8			22,864.9	2,336.8	25,201.7	34.7
Transportation	1.8[c]	16,693.9[f]	684.8			17,380.5	14.5	17,395.0	23.9
Electric Utility	8,531.2	3,284.2	3,525.1	3,143.5	1,210.7	19,694.7	Generation 6,368.2	Waste Heat 13,326.5	18.7
Other							Dom. Use 5,834.3	Lost&Unacc. 577.2	0.8
Total Source Consumption	12,383.5	33,891.1	22,041.5	3,143.5	1,210.7	Total 72,670.3	Imports 43.3	Grand Total 72,713.6	100.0
Percentage	17.0	46.6	30.3	4.3	1.7	100.0			

Footnotes to Tables B8 and B9 (Sum of Fifty States and U.S. Total)

[a]Includes small amounts of anthracite coal

[b]Includes small amount of anthracite coal; does not include imported coke

[c]Includes coal used by bunker lake vessels

[d]Includes imported kerosine

[e]Includes LPG and ethane for chemical and synthetic rubber manufacture and imported distillate and residual oils

[f]Includes imported distillate and residual oils for bonded bunker use, distillate and residual oils used by the military, and non-military use of aviation turbine fuel

APPENDIX C

METHODOLOGY FOR PREPARATION OF ENERGY CONSUMPTION PATTERN TABLES

METHODOLOGY*

STATE AND SUM OF FIFTY STATES

I. Coal Consumption

A. R/C Sector - Amounts reported as distributed to "Retail Dealers" in Table 44 of (1) and (2), "Distribution of bituminous coal and lignite, in (year) by destination and consumer use". Does not include figures for "Canada", "Mexico", and "Destination not revealable".[1,2]**

B. Industrial Sector - Amounts reported as distributed to "Coke and gas plants" and "All others" in Table 44 of (1) and (2), "Distribution of bituminous coal and lignite, in (year) by destination and consumer use". Does not include figures for "Canada", "Mexico", and "Destinations not revealable".[1,2]

C. Transportation Sector - Amounts of bituminous and lignite coal used for "Vessel bunkers" and "Railroads" are not reported on a state-by-state basis. The amount of coal used for transportation fuel is relatively small.

D. Electric Power Generation Sector - Quantities of coal in tons used

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*The procedures described here yield data in physical units of weight or volume. They are converted to energy equivalents in 10^{12} Btu according to heat values listed in Appendix E.

**Footnotes are listed at the end of this section; references in parentheses are listed in Appendix F.

for fuel in thermal power plants of all types reported in (3) and (4) "Consumption of fuel by electric utilities for production of electric energy by state, kind of fuel, and type of prime mover"; includes small amounts of anthracite coal.[1]

II. Petroleum Products Consumption

A. R/C Sector

1. Liquefied Petroleum Gases (LPG) - All LPG sold to or used in private households for space heating, cooking water heating, and other household uses, such as clothes dryers and incenerators. Also included are sales to non-manufacturing organizations or institutions, such as hotels, motels, restaurants, retail stores, laundries, schools, hospitals, and other service enterprises, primarily for use in space heating, water heating and cooking. These quantities are reported in Table 3 of (5) and (6) as "Sales of liquefied petroleum gases for residential and commercial use, by type".[1]
2. Kerosine - Quantities of kerosine reported sold for "Heating" purposes in Table 5 of (7) and (8). This includes small amounts used in industry but reported as heating fuel.[1]
3. Distillate fuel oil - Quantities reported in Table 6a of (7) and (8) as "Distillate type heating oils"; includes numbers 1, 2 and 4 oils: excludes diesel fuel.[1]
4. Residual fuel oil - Quantities reported in Table 7 of (7) and (8) as "Residual type heating oils"; includes number 5 and 6 oil.[1]

B. Industrial Sector

1. Liquefied petroleum gases - Quantities of LPG used by tractors, irrigation pump engines, forklift and other agricultural or

industrial vehicles, and oil field drilling and production engines. Also included are quantities of LPG sold to or used by manufacturing plants of all types for standby fuel, space heating, or other uses such as flame cutting, metallurgical furnaces and plumbers' torches. LPG used for various agricultural purposes such crop drying, poultry breeding, swine production, and other farm uses are included in this category. Small quantities purchased by gas utility companies for distribution through the mains and for repressurization fuel are also included. From Tables 4,5,6 and 7 of (5) and (6). [1,3]

2. Kerosine - Quantities of kerosine used by manufacturing plants and in agriculture as fuel for boilers, tractors, space heating, etc. Includes small quantities used for lamps, cooking stoves etc. which may belong in R/C sector. Reported as "All other use" in Table 5 of (7) and (8).[1]

3. Distillate fuel oil - Quantities reported in Table 8 of (7) and (8) as "Industrial use"; Table 9 of (7) and (8). "Oil company use"; and Table 14a of (7) and (8), "Miscellaneous uses: diesel-type off-highway" and "Miscellaneous uses: other uses" are included in this category. It is used primarily as boiler fuel for process steam, space heating, agriculture, oil field drilling, production operations, etc.[1]

4. Residual fuel oil - The amount of residual fuel oil sold for industrial use includes quantities reported in Table 8 of (7) and (8), "Industrial Use" (primarily boiler fuel); Table 9 of (7) and (8) "Oil Company Use" (refinery operations etc.) and Table 14 of (7) and (8) "Miscellaneous Uses: residual-type oils", may include a small amount of crude oil.[1]

5. Gasoline - Industrial gasoline use includes "Agriculture", "Industrial and Commercial", "Construction", "Miscellaneous", and "Unclassified"

gasoline consumption reported in Table MF-24 of (9) and (10). These are mostly non-highway vehicle fuel uses computed from highway fuel tax refund data.[1,4]

6. Asphalt and Road Oil - Total of all asphalt and road oil by state reported in Table 5 of (11) and (12).

C. Transportation Sector

1. Distillate fuel oil and diesel fuel - Quantities of distillate fuel oil reported in Table 10 and 11 of (7) and (8) as distillatetype oils for "Railroad use" and "Vessel bunkering use" respectively. Also included are quantities reported in Table MF-25 of (9) and (10) as "Private and commercial highway use of special fuels", primarily diesel fuel with small amounts of LP gas.[1]

2. Residual fuel oil - Quantities of residual fuel oil reported in Tables 10 and 11 of (7) and (8) as residual-type oils for "Railroad Use" and "Vessel bunkering use" respectively.[1]

3. Gasoline - Transportation gasoline use includes "Highway use of gasoline" in Table MF-26 and "Marine use" in Table MF-24 of (9) and (10). Also included is "Aviation gasoline sales" in (13) and (14).[1]

D. Electric Power Generation Sector - Quantities of oil in barrels used for electric generation reported in (3) and (4) as "Consumption of fuel by electric utilities for production of electric energy by state, kind of fuel, and type of prime mover"; includes oil used for steam, gas turbine, and internal combustion methods of electric generation.[1]

III. Natural Gas Consumption

A. R/C Sector - Quantities of natural gas delivered to consumers identified as "Residential, " "Commercial," and "Other consumers" in Table 7 of (15) and (16).[1]

B. Industrial Sector - Quantities of natural gas delivered to consumers identified as "Industrial" in Table 7 of (15) and (16) plus "Lease Plant fuel" in Table 6 of (15) and (16) plus "Transmission loss and unaccounted for" in Table 4 of (15) or "Unaccounted for" in Table 4 of (16).[1,5]

C. Transportation Sector - Quantities of natural gas identified as "Pipeline fuel" in Table 6 of (15) and (16). Pipeline fuel is used to repressurize natural gas pumped through pipelines.[1]

D. Electric Power Generation Sector - Quantities of natural gas used for electric generation reported in (3) and (4) as "Consumption of fuel by electric utilities for production of electric energy by state, kind of fuel and type of prime mover"; includes gas used for steam, gas turbine, and internal combustion methods of electric generation.

IV. Hydro and Nuclear Electric Power

Quantities of electricity generated by hydroelectric and nuclear power plants reported as "Net generation of electric utilities by state and type of prime mover" in (3) and (4) converted to Btu using heat values in Appendix E. These energy sources are used only by the electric generating sector.[1]

V. Total Primary Fuel to Sectors

For each consuming sector the sum of the inputs of three fossil fuels (coal, petroleum products and natural gas) constitutes the total primary fuel input to that sector. For the electrical sector, the primary inputs include hydroelectric and nuclear power.

VI. Electricity*

Quantities of electrical energy delivered to consumers are converted to their equivalent heat values in trillion Btu, using values given Appendix E.

A. R/C Sector - Annual totals of monthly quantities of electricity reported in Table 15 of (17), (18), and (19), "Sales of Electric Energy to Ultimate Consumers" as "Residential", "Commercial", and "Other".[1,6]

B. Industrial Sector - Annual totals of monthly quantities of electricity reported in Table 15 of (17), (18), and (19), "Sales of Electric Energy to Ultimate Consumers", as "Industrial Sales".[1]

C. Transportation Sector - Quantities of electricity used by electric railroads and railways reported Table 22S, "Energy Sales-Total Electric Utility Industry: by states and classes of service" in (20) and (21).

D. Generation - Electricity generated by the electric utility industry in each state, reported in (3) and (4) as "Net generation of electric utilities by state and prime mover".

E. In-State Use - The sum of the electricity used in the R/C, Industrial, and Transportation Sector.

F. Lost and Unaccounted For - The loss for each state is assumed to be proportional to the U.S. transmission loss which is calculated from U.S. Total data. This procedure is described in Appendix D "Explanation of Electrical Energy Components of State Energy Consumption Pattern Table" Part C "Lost and unaccounted for". State losses are calculated by multiplying the ratio $\frac{\text{U.S. Transmission Loss}}{\text{U.S. Total Generation}}$ by the state's total generation.

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*A detailed description of the components of this sector is given in Appendix D

G. Exports/Imports - This figure is obtained by adding "In-State Use" to "Lost and Unaccounted For". If the sum is greater than "Generation" the difference is considered to be "Imports". If the sum is less than "Generation" the difference is considered to be "Exports".

VII. Total Energy Input

For each consuming sector the total energy input is the sum of the energy contributed by the primary fuels plus the electricity distributed to the sector from the electric power sector. In the electric power sector the total energy input is defined as the energy rejected to the environment as waste heat. The sum of the total energy inputs to each of the three consuming sectors, plus the waste heat and lost and unaccounted for electricity from the electric power sector, yields the net grand total energy use within a given state. This sum may be greater or less than the sum of the total primary fuel input in a state, depending on whether or not that state is a net importer or exporter of electric energy.

SUM OF SIX STATES

The energy consumption pattern for the six-states is obtained by summing the appropriate components of the energy consumption patterns of the states comprising the region.

U.S. TOTAL

The methodology for compiling the U.S. total energy consumption pattern is similar to that used for the sum of the fifty states. However totals for coal and petroleum are augmented to include fuels which are not available on a state-by-state basis. These changes are noted below. Complete

sector subtitutions are noted by an asterisk (*). Otherwise the changes are additions to the sum of the fifty states methodology.

I. Coal Consumption

A. R/C Sector*

1. Bituminous & Lignite - Amounts reported as "Retail deliveries to other consumers" in Table 40 of (1) and (2), "Consumption of bituminous coal and lignite, by consumer class, and retail deliveries in the United States".[1,†]

2. Anthracite - Amounts reported as "Residential/commercial heating' in Table 24 of (22), "Consumption of Pennsylvania anthracite in the United States, by consumer categories".[1]

B. Industrial Sector*

1. Bituminous and Lignite - Amounts reported as "Manufacturing and mining industries" in Table 40 of (1) and (2), "Consumption of bituminous coal and lignite, by consumer class, and retail deliveries in the United States". Includes coal used in beehive coke plants, oven coke plants, steel and rolling mills, and other manufacturing and mining industries.[1]

2. Anthracite - Amounts reported in Table 24 of (22), "Consumption of Pennsylvania anthracite in the United States, by consumer categories" as "colliery fuel", "iron and steel industry" and "other uses".[1]

C. Transportation Sector* - Amount reported as "Bunker lake vessel and foreign" in Table 40 of (1) and (2), "Consumption of bituminous coal and lignite, by consumer class, and retail deliveries in

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†Footnotes are listed at the end of this Appendix; references in parentheses are given in Appendix E.

the United States".[1]

II. Petroleum Products Consumption

A. R/C Sector - Quantities of kerosine reported in Table 4 of (7) and (8).[1]

B. Industrial Sector

1. Quantities of LPG for synthetic rubber and chemical use reported in Table 8 of (5) and (6).[1]

2. Quantities of other distillate and residual oil reported in Table 4 of (7) and (8).[1]

C. Transportation Sector

1. Distillate fuel oil reported in Table 12 of (7) and (8), "Military Use--distillate type oils" and Table 4 of (7) and (8), "Bonded Bunker Oil".

2. Residual fuel oil reported in Table 12 of (7) and (8), "Military Use--residual type oils" and Table 4 of (7) and (8), "Bonded Bunker Oil".

3. Aviation turbine(jet) fuel sales (excluding sales to the military) reported in (13) and (14).

FOOTNOTES

[1]Revised consumption, distribution, or sales figures usually published in reports covering consumption, distribution, or sales for year following year in question are used where possible.

[2]Amounts of bituminous and lignite coal reported in (1) or (2) represent amounts distributed to the consuming sector. The distribution data does not exactly reflect actual consumption because distribution is total amount shipped from mines, some of which was in transit to consumers or in consumers' storage at the time of the report.

[3]Total amounts of LPG reported in Tables 4,5,6, and 7 of (5) and (6) are included in this sector. Highway use is not subtracted from the total, even though this amount is also included in the transportation sector, because not all states report amounts of LPG used, resulting in a number of blank entries. The amount of fuel double-counted is negligible in all states.

[4]Amounts of highway and non-highway use of gasoline were determined by the Department of Transportation (DOT), principally by analysis of data on taxed gallons, exemptions and refunds. Estimates for states that report no exemptions or refunds for non-highway use were based on data for states having similar fuel use characteristics. The highway fuel consumption data are reliable for most states, but in a few states refund claims for non-highway fuel use appear to be excessive, indicating that alleged non-highway use is actually on-highway use. To the extent that this occurs, the highway consumption is understated. See footnotes to Tables MF 21-26 of (9) and (10).

[5]Between 1974 and 1975, the category title in Table 4 of (15) and (16) changed from "transmission loss and unaccounted for" to "Unaccounted for". However, the "Unaccounted for" category still includes transmission loss.

[6]"Other" also includes electricity used by railroads and railways. It is not subtracted from the total, even though this amount is also included in the transportation sector. The amount of electricity double-counted is negligable.

APPENDIX D

EXPLANATION OF ELECTRICAL ENERGY COMPONENTS OF ENERGY CONSUMPTION PATTERNS TABLES

The understanding of energy use pattern information in the electric power sector poses special problems, given that electricity is both a consuming sector and an energy source. Therefore, a brief explanation is provided here on how to interpret the figures for electricity in the tables.

Column 6 represents the total primary energy inputs to each of the consuming sectors, including electric power. By adding columns 1, 2, 3, 4, and 5 across any sector row the sector total can be obtained. The "Total" given in column 6 is obtained either by summing the "Total Primary Fuels to Sector" column or by adding across the "Total Source Consumption" row.

"Distributed Electricity" has five components:

a. Generation

b. In-State Use

c. Lost and Unaccounted for

d. Exports/Imports

e. Waste Heat

The following calculations using values for Illinois - 1975 (Table A1) illustrate how each of these components are derived:

a. 316.5 (Generation - from (4))*

b. 186.7 (Residential/Commercial - from (4))
103.5 (Industrial - from (4))
1.1 (Transportation - from (21))
291.3 In-State Use

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*Numbers in parentheses refer to references listed in Appendix F

c. 1. Obtain $\frac{\text{U.S. transmission loss}}{\text{U.S. generation}}$ ratio

a. $\begin{array}{rl} 5{,}916.7 & \text{(Domestic Use - Electricity - from (4))} \\ - \quad 21.1 & \text{(U.S. Imports - from (21) "Summary Table")} \\ \hline 5{,}895.6 & \text{(Domestically generated electricity)} \end{array}$

b. $\begin{array}{rl} 6{,}543.0 & \text{(Total Generation - from (4))} \\ - \quad 5{,}895.6 & \text{(Domestically generated electricity)} \\ \hline 647.4 & \text{(U.S. Transmission loss and unaccounted for)} \end{array}$

c. $\frac{647.4 \text{ (Transmission loss)}}{6{,}543.0 \text{ (U.S. Total generation)}} = 0.099$

2. Obtain state loss and unaccounted for

a. $(0.099)\ (316.5) = 31.3$

d. $\begin{array}{rl} 291.3 & \text{(In-State Use)} \\ 31.3 & \text{(Lost and unaccounted for)} \\ \hline 322.6 & \\ -316.5 & \text{(Generation)} \\ \hline 6.1 & \text{(Imports to state)} \end{array}$

e. $\begin{array}{rl} 997.5 & \text{(Total primary fuels to electric power sector)} \\ -316.5 & \text{(Generation)} \\ \hline 681.0 & \text{(Waste heat)} \end{array}$

APPENDIX E

CONVERSION FACTORS

Coal-Bituminous and Lignite*

U.S.	1974 - 23,070,000 Btu/sh ton 1975 - 22,800,000 Btu/sh ton	
Illinois	22,780,000 Btu/sh ton	
Indiana	23,200,000 Btu/sh ton	
Kentucky	25,460,000 Btu/sh ton	
Ohio	24,600,000 Btu/sh ton	
Pennsylvania	26,720,000 Btu/sh ton	
West Virginia	26,800,000 Btu/sh ton	

electric generation	1974†	1975‡
U.S.	10,872 Btu/lb	10,825 Btu/lb
Illinois	10,185 Btu/lb	10,135 Btu/lb
Indiana	10,663 Btu/lb	10,615 Btu/lb
Kentucky	10,661 Btu/lb	10,741 Btu/lb
Ohio	10,873 Btu/lb	10,960 Btu/lb
Pennsylvania	11,660 Btu/lb	11,776 Btu/lb
West Virginia	11,485 Btu/lb	11,610 Btu/lb

Liquefied petroleum gases	4,011,000 Btu/bbl§
Kerosine	5,670,000 Btu/bbl§
Distillate fuel oil	5,825,000 Btu/bbl§
Residual fuel oil	6,287,000 Btu/bbl§
Gasoline (including aviation gasoline)	5,248,000 Btu/bbl§
Asphalt and road oil	36,500,000 Btu/sh ton

Fuel oil-electric generation	1974†	1975‡
U.S.	145,841 Btu/gal	146,006 Btu/gal
Illinois	147,796 Btu/gal	145,280 Btu/gal
Indiana	138,153 Btu/gal	137,931 Btu/gal
Kentucky	130,369 Btu/gal	132,784 Btu/gal
Ohio	145,850 Btu/gal	143,631 Btu/gal
Pennsylvania	144,448 Btu/gal	144,015 Btu/gal
West Virginia	139,050 Btu/gal	138,790 Btu/gal

	1974	1975
Natural gas	1,024 Btu/ft^3[#]	1,021 Btu/ft^3[#]
Natural gas-electric generation		
U.S.	1,028 Btu/ft^3[†]	1,024 Btu/ft^3[‡]
Illinois	1,042 Btu/ft^3[†]	1,029 Btu/ft^3[‡]
Indiana	1,003 Btu/ft^3[†]	1,000 Btu/ft^3[‡]
Kentucky	1,023 Btu/ft^3[†]	1,025 Btu/ft^3[‡]
Ohio	1,011 Btu/ft^3[†]	853 Btu/ft^3[‡]
Pennsylvania	1,030 Btu/ft^3[†]	1,000 Btu/ft^3[‡]
West Virginia	1,100 Btu/ft^3[†]	645 Btu/ft^3[‡,¶]
Hydro-electricity	10,442 Btu/kwh[#]	10,406 Btu/kwh[#]
Nuclear-electricity	10,660 Btu/kwh	
End use electricity (all sectors)	3,412 Btu/kwh	

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[*] U.S. Department of the Interior, Bureau of Mines. Fuel and Energy Data-U.S. by States and Census Divisions, 1974. Information Circular 8739. 1977. P. 6.
With the exception of the U.S. figure, no change was recorded by BOM between 1974 and 1975. The 1975 figure was obtained by personal communication with Charles Readling, Department of Energy.

[†] National Coal Association. Steam Electric Plant Factors/1975 edition. Table 2, "Summary of Table 1, by Region and State-1974". National Coal Association, Economics and Statistical Services. January 1976.

[‡] National Coal Association. Steam Electric Plant Factors/1976 edition. Table 2, "Summary of Fuel Consumption, Quality and Cost by Plant for 1975 by Fuel." National Coal Association, Economics and Statistical Services. January 1977.

[§] 42 gallons = 1 barrel

[#] U.S. Department of Energy, Energy Information Administration. Monthly Energy Review. June 1978. p.91

[¶] Monongahela Power Company's Rivesville plant burns coke oven gas, refinery gas, and blast furnace gas. Because West Virginia uses such minimal amounts of natural gas, the inclusion of these fuels in the state totals lowers the average Btu/ft^3 value for the state. -- Personal communication from K. Lin, National Coal Association.

APPENDIX F

SOURCES

1. U.S. Department of the Interior, Bureau of Mines. "Coal-Bituminous and Lignite in 1974." In Minerals Yearbook 1974, Vol. I: Metals, Minerals and Fuels.

2. U.S. Department of the Interior, Bureau of Mines. "Coal-Bituminous and Lignite in 1975." In Minerals Yearbook 1975, Vol I: Metals, Minerals and Fuels.

3. Federal Power Commission. "1974 Power Production, Capacity, Fuel Consumption Data." Federal Power Commission News Release 22686.

4. Federal Power Commission. "1975 Power Production, Capacity, Fuel Consumption Data." Federal Power Commission News Release 23017

5. U.S. Department of the Interior, Bureau of Mines. "Sales of Liquefied Petroleum Gases and Ethane in 1975." Mineral Industry Surveys. October 2, 1976.

6. U.S. Department of Energy, Energy Information Administration. "Sales of Liquefied Petroleum Gases and Ethane in 1976." Energy Data Reports. January 24, 1978.

7. U.S. Department of the Interior, Bureau of Mines. "Sales of Fuel Oil and Kerosine in 1975." Mineral Industry Surveys. September 17, 1976.

8. U.S. Department of Energy, Energy Information Administration. "Sales of Fuel Oil and Kerosine in 1976." Energy Data Reports. December 12, 1977.

9. U.S. Department of Transportation, Federal Highway Administration, Highway Statistics Division. "Moter-Fuel Consumption and Taxation Tables-1974." October 6, 1975.

10. U.S. Department of Transportation, Federal Highway Administration, Highway Statistics Division. "Moter-Fuel Consumption and Taxation Tables-1975." February 2, 1977.

11. U.S. Department of the Interior, Bureau of Mines. "Sales of Asphalt in 1975." Mineral Industry Surveys. July 19, 1976.

12. U.S. Department of the Interior, Bureau of Mines. "Sales of Asphalt in 1976." Mineral Industry Surveys. June 27,1977.

13. Ethyl Corporation. "Yearly Report of Gasoline Sales-by States, 1974." (Ethyl Corporation, Petroleum Chemicals Division, Houston, Texas).

14. Ethyl Corporation. "Yearly Report of Gasoline Sales-by States, 1975." (Ethyl Corporation, Petroleum Chemicals Division, Houston, Texas).

15. U.S. Department of the Interior, Bureau of Mines. "Natural Gas Production and Consumption: 1974". Mineral Industry Surveys. August 29, 1975.

16. U.S. Department of the Interior, Bureau of Mines. "Natural Gas Production and Consumption: 1975." Mineral Industry Surveys. October 4, 1976.

17. Federal Power Commission. "Electric Power Statistics." January-December, 1975.

18. Federal Power Commission. "Electric Power Statistics." January-September, 1976.

19. U.S. Department of Energy, Energy Information Administration. "Electric Power Statistics." Energy Data Reports. October-December, 1976.

20. Edison Electric Institute, Statistical Year Book of the Electric Utility Industry, for 1975, Number 43. October 1976. Edison Electric Institute, New York.

21. Edison Electric Institute. Statistical Year Book of the Electric Utility Industry, for 1976, Number 44. October 1977. Edison Electric Institute, New York.

22. U.S. Department of the Interior, Bureau of Mines. "Coal-Pennsylvania Anthracitein 1975." In Minerals Yearbook 1975, Vol I: Metals, Minerals, and Fuels.